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Illuminating Engineer

XXVIII. February, 1935 Price 9

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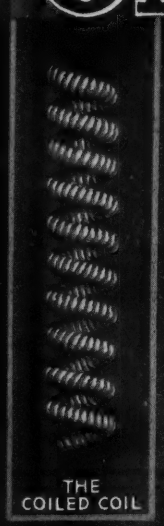

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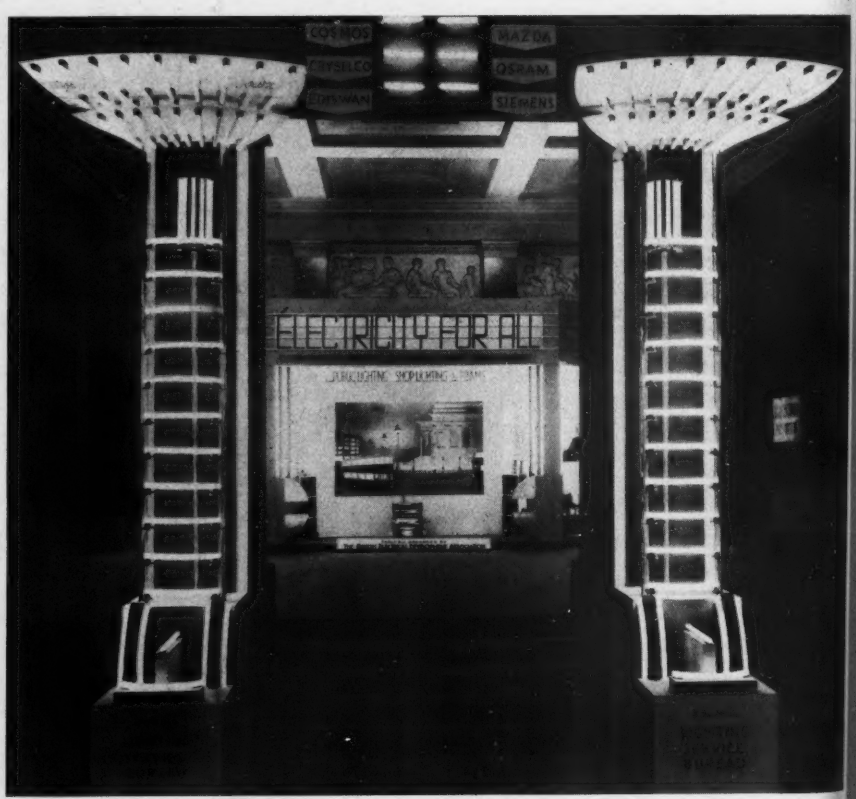

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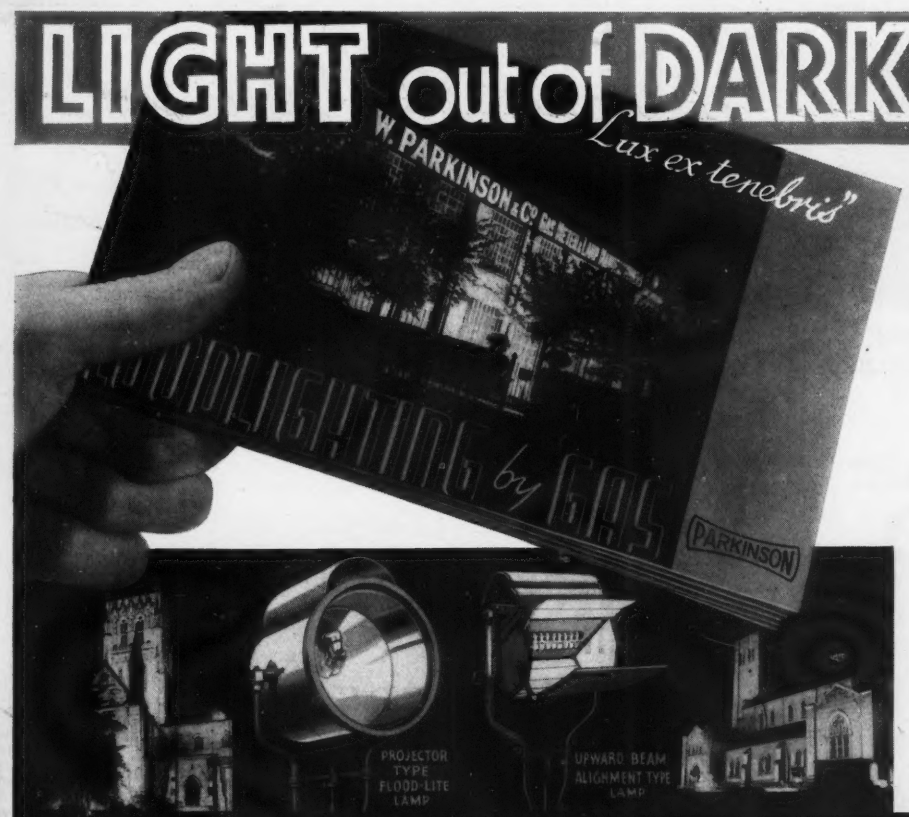

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Artistic Floodlighting

FLOODLIGHTING has been the subject of constant comment (and sometimes criticism) by those, such as architects, who are interested in its aesthetic aspects.

Mr. Bloor's recent paper before the Illuminating Engineering Society (see p. 35) was concerned mainly with appearance and artistic effect rather than with technicalities. It is doubtless true that much depends on the artistic sense of the man in charge—he must know what to leave out as well as what to emphasise. In illuminating an ancient building or a ruined castle we are concerned with general appearance, not details. We wish to see or get a pleasing glimpse of objects half revealed, not an exact scrutiny that enables every crevice in the walls to be detected.

Hitherto, admittedly, the use of floodlighting has been mainly practical and commercial. But in order to illuminate historic buildings, to render a city beautiful by night, softer effects, moderate diffusion and lesser brightness (at proportionately lesser cost) may often answer our purpose best.

Warning Signs for "Built-up Areas"

Evidently the discrimination of what constitutes a "built-up area," according to the new Road Traffic Act, is not to be based merely on the existence of public lighting. We notice in the Press illustrations of the proposed distinctive sign, a circular band-device with the figures "30" in the centre to indicate the speed limit, which is to mark out the boundaries of such areas. Apparently there will also be permissive signs indicating when no speed limit is imposed, in spite of the fact that regular road lighting is provided—for example, on certain arterial roads and the like. When the Act was under discussion it was widely contended that the mere existence of street lighting could not safely be regarded as the sole indication of an area in which the speed limit must be observed. One is glad to observe that this is now recognised. One point that will certainly require consideration is the illumination of such warning devices, which should be visible by night as well as by day.

Comparative Effects by Yellow (Sodium) and White Light

A useful contribution to knowledge on the above much-debated subject is to be found in a recent report by Dr. James E. Ives to the United States Public Health Service. The research is specially interesting for the fact that it was extended over a relatively long period. All the groups of subjects examined performed intensive clerical work for about four hours a day during twelve weeks. The tasks consisted of the tabulation of statistics, the additions of columns of figures, and the determination of averages. One group worked in a room illuminated only by sodium vapour lamps, the other control group in a room lighted to a similar intensity (9.5-10.5 foot-candles) by tungsten lamps. Both rooms were without windows so that artificial light was exclusively used. The results of the investigation seem to be entirely negative, i.e., the sodium light had no permanent effect, beneficial or detrimental, on eyesight which could be detected by the clinical tests applied, and there was no significant difference in the amount of work performed in the two cases.

Discomfort and Disability Glare

There has been much discussion on the nature of the above two forms of glare. Some light is shed on the problem by a recent investigation by M. R. Harbinson and F. C. Bartlett, recently communicated to the British Journal of Psychology. Observers were asked to call out the number of dots in patterns, exposed successively at controlled speeds. When the speed was such that an observer could carry out the task without noticeable strain the introduction of glare produced discomfort—but no decrement in work. In other words there was some degree of suffering but no loss in "efficiency." At the maximum speed consistent with perfect performance, however, there *was* marked decrement of work—though at still higher speeds the difference in efficiency of work under glare conditions and normal conditions was less. The experiment was to illustrate one important point—that persons may suffer considerable discomfort through glare and yet bring their visual performance up to standard by extra effort. In this case, whenever glare was present the observers were evidently making extra efforts, "gripping the sides of the chair in which they sat, moving restlessly, getting breathless and flushed or pale and tense." It must, we think, be conceded that glare which produced such effects is prejudicial. It has always seemed evident to us that the manifold effects of glare, in the streets, for example, could not be judged merely by laboratory experiments on the degree to which power of perception was impaired. On one most important effect of glare in street lighting—its tendency to distract attention of drivers at critical moments—little evidence is forthcoming.

Ceilings That Both Reflect and Transmit Light

The use of translucent ceilings which serve to admit both daylight and artificial light is now a familiar idea. A more original form of ceiling is that devised by a French architect, M. Beard, and recently described in B.I.P., which transmits daylight and *reflects* artificial light. The ceiling is composed of prismatic glass elements which scatter natural light by day but by night reflect downwards the light from a series of pendants in direct silvered reflector-units, each containing 500-watt lamps, supplemented by cornice-lighting. The consumption, however (70 watts per square metre), required to furnish an illumination of approximately 7 ft.-c. does seem rather formidable.

TECHNICAL SECTION

COMPRISING

Transactions of The Illuminating Engineering Society and Special Articles

The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.

The Illuminating Engineering Society

Notes on Recent Meetings & Events

Meeting in London, January 8.

A MEETING of the Illuminating Engineering Society took place in the Lecture Theatre of the Institution of Mechanical Engineers (Storey's Gate, Westminster, S.W.1), on Tuesday, January 8. Members assembled for light refreshments at 6.30 p.m., and the chair was taken by the President (Mr. H. Hepworth Thompson), at 7 p.m.

The Minutes of the last meeting having been taken as read, the Hon. Secretary read out the names of applicants for membership, which is appended. The names of those presented at the last meeting on December 11* were read again, and these gentlemen were formally declared members of the Society.

The President then called upon Mr. L. G. Applebee to present his paper on " A Cavalcade of Stage Lighting," in which developments from the earliest ages up to recent times were traced, and the influence of each new advance in lighting technique on methods of stage lighting was in turn discussed. Special attention was devoted to methods of applying coloured light, to the cyclorama and to shadow effects, which were illustrated by numerous lantern slides of British and Continental theatres. In the course of his address, Mr. Applebee also arranged a number of demonstrations, showing the effect of coloured light on painted scenery and illustrating the use in stage effects of garments impregnated with fluorescent materials and exposed to ultra-violet radiation.

In the subsequent discussion, Mr. C. Harold Ridge, Mr. R. Gillespie Williams, Mr. F. C. Smith, Mr. F. R. Bentham, Mr. T. P. Bennett, Mr. Harold Bright took part. After Mr. Applebee had replied to comments, a cordial vote of thanks to him for his paper terminated the proceedings.

(Mr. Applebee's paper and the ensuing discussion will appear in our next issue.)

* Illum. Eng., Jan., 1935, p. 5.

Forthcoming Events.

February 5. Annual Dinner *of the Illuminating Engineering Society, at the Trocadero Restaurant, Piccadilly, W.;* **7 for 7.30 p.m.**

February 19. Mr. J. M. Waldram and Mr. J. M. Sandford on **The Characteristics of Tungsten Filament Lamps for Flashing Signals, Signs, and Beacons** *(General Meeting of the Illuminating Engineering Society to be held at the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1);* **6.30 p.m.**

March 12. Mr. H. N. Green on **Recent Developments in the Lighting of Airways and Aerodromes** *(Joint Meeting of the Illuminating Engineering Society and the Royal Aeronautical Society, to be held at the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1);* **6.30 p.m.**

Applicants for Membership.

Corporate Members:—

Pickvance, W. G. .....525, Stretford Road, Old Trafford, Manchester.

Rawson-Bottom, W. E....52, Gt. Marlborough Street, London, W.1.

Stewart, E. J. .....Lighting Department, 20, Trongate, Glasgow, C.1.

Watson, A. G. .....Gas Accumulator Company (U.K.), Ltd., Beacon Works, Erentford, Middlesex.

Affiliated Students:—

Maddams, L. G. .....18, Dulwich Village, London, S.E.21.

Hopkinson, R. G. .....Northdene, Woolwich Road, Abbey Wood, London, S.E.2.

Road Surface Reflection Characteristics and their Influence on Street Lighting

AT a meeting of the local North-Western section of the Illuminating Engineering Society, held in Manchester on January 16, Mr. J. M. Waldram gave an address on lines similar to those followed in his paper before the A.P.L.E. last September. (Illum. Eng., Oct. and Nov., 1934).

Mr. A. E. Jepson, who presided, congratulated the author on his address and remarked on the difficulty of compressing into an hour's talk the results of work that must have taken many months. He invited those present to question Mr. Waldram on any points that were not quite clear.

Mr. James Sellars (Lighting Superintendent, Manchester) remarked that it was only comparatively recently that a technique for planning lighting installations had been evolved. Lighting engineers were finding it necessary to approach the subject from new standpoints—for example, from that of perspective. Whilst it was usually agreed that lamps should be placed on the outside of a curve, the most satisfactory position had hitherto been difficult to determine with accuracy. He recalled a case in which the lighting from the standpoint of the motorist had been good on the plan, but wrong in perspective.

Mr. Carr (Manchester Corporation Electricity Department) also commented on the novel method of approach adopted in the lecture. He recalled that the absence of consideration of reflection from road surfaces, as a factor in visibility, in the British Standard Specification had been the subject of criticism. He was interested to observe that a fitting giving a "flat-bottomed" curve of light distribution was considered most desirable for getting rid of dark spots on the road surface. This confirmed results obtained in Manchester. In minor road lighting, vertical illumination as well as horizontal illumination was of importance. Reflections and shadows were both important means of improving visibility. Some of the facts emphasised in the paper hardly seemed to accord with the principles of design of certain fittings. It appeared that light approaching the driver was best for the purpose of reflection; yet some modern fittings were designed to throw the greater part of light in the reverse direction. He doubted whether a motorist usually fixed his eye on a spot 300 ft. ahead. He should also pay attention to the road immediately in front of him, where pedestrians stepping off the kerb were likely to cause most trouble. In any case, when approaching the headlamps of another car, the distance of vision was frequently limited to 30 or 40 feet. Finally, it should be remembered that street lighting was for the public service and utility. Therefore, installations should be designed with a view to the comfort of the pedestrian and householder as well as the motorist.

Mr. W. E. Ballard enquired whether, when making perspective plans, the camber of the road had to be taken into consideration; also whether materials ordinarily used for road surfaces could be arranged in order of merit as regards reflection of light.

Mr. R. C. Hawkins mentioned instances of road lighting where the conditions had been adversely affected by re-surfacing. He also asked whether any definite understanding in regard to the effect of the colour of a source on visibility had yet been reached.

Mr. Fennel commented on the entirely new view of road lighting presented in the paper. Formerly light-coloured sandy surfaces, constituting good diffusing media, were preferred. All parts of the road gave some reflection. The effect was merely a question of foot-candles on a horizontal plane. Now one had surfaces composed of many facets or small black mirrors. One could become aware of the presence of an object on the road in two ways: (1) by the direct rays of the nearer lamps giving the shape of the object; (2) by the light patches against which the object was silhouetted.

Mr. Waldram, interposing, pointed out that although the reflection, as seen by the eye, appeared quite bright, the amount of light thus reflected might be quite small. Thus a candle could be seen at a distance of one mile, even though the illumination from it at that distance was minute. Vertical illumination of an object might give rise to a condition such that the brightness of the object became the same as that of its background, in which case it became invisible.

A vote of thanks to Mr. Waldram for his address was proposed by Mr. Bransfield, who remarked that the new method he described enabled good visibility to be attained with dark objects and relatively weak illuminations—both things that usually presented difficulties to illuminating engineers.

Mr. Pryor, who seconded the vote of thanks, pointed out that the road surface was only one amongst many items bearing on street lighting. There was a great difference between the demands of a city street, where there were shops and houses, and those of a country road.

Mr. Statham (Borough Engineer, St. Helens) thanked the Society for facilities to attend the meeting, in which he had been much interested. He asked if there was available any data on the reflection factors of different road surfaces, and the comparative effect when wet and dry.

Mr. Waldram, in reply, agreed with Mr. Sellars that it was essential to place lamps on the outside of curves, but suggested that closer spacing should be used. As a member of the Committee responsible for the British Standard Specification, he appreciated Mr. Carr's criticism. In the case of nearly all B.S. specifications an expert was required to interpret them. The Street Lighting Specification merely tried to classify streets. The relation of vertical illumination to brightness was under consideration, but in any case the pedestrian must gain by better illumination of the road surface. One important effect of good road brightness was to diminish the apparent glare from sidelights of cars. One Continental installation using low cut-off fittings gave good visibility with only a low illumination; but any extraneous light, even that of a cycle lamp, was apt to cause glare owing to the sensitiveness of the retina. The effect of a camber was to incline the areas of brightness towards the centre of the road. He could not place road surfaces in order of merit, but redressing of surfaces with chips might spoil the effect of a good installation. Fittings having a maximum beam going away from the driver were designed before the work described in his lecture was completed, although actually the light flux in both directions was about the same, only the distribution being slightly different. Under wet conditions some roads became worse than others; one could not apparently get a surface that would be equally good, wet and dry. It was difficult to say how colour affected an installation; recent tests showed, however, that, in the kind of fog that held up traffic, no specific colour had any pronounced advantage.

Floodlighting by Gas

By H. E. BLOOR, B.Sc., B.Eng., M.Inst. Gas E.

(The York Gas Company.)

(Paper read at the Meeting of the Illuminating Engineering Society, held at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1, at 6.30 p.m., on Tuesday, December 11, 1934.)

Figure 1. The Bar Walls, Old Mortuary and Lendal Tower floodlighted by gas during York's Civic Week, 1934.

Introduction.

The request to present a paper to your Society on the subject of Gas Floodlighting was only accepted under pressure. It seemed that lack of time and material provided ample excuse for refusal. While I am assured that the undeniable beauty of the pictures which I hope to show will give you pleasure, I felt that my experience has not been of such a nature as to provide adequate material for presentation to an essentially scientific society such as this.

The writer has worked almost entirely on empirical lines, and had no facilities for ascertaining and recording scientific data which might have been established from his work. No attempt, therefore, will be made to interpret results revealed in the pictures in technical terms.

The paper is, in fact, an expression of a layman's experience. It is addressed primarily to those who, like myself, are concerned mainly with the practical benefits and artistic effects of floodlighting, although it is hoped that those who are expert in the techniques of light utilisation will also find the illustrations and descriptive matter of some interest.

It was not until the writer had seen the first example of electric floodlighting that his attention was drawn to a subject which at once presented itself as one of first-class importance.

Some inventions are destined to be ephemeral, while others are to become, in the fullness of time, in universal use; and for many years it has been a habit of the writer to attempt to detect, in the early stage, movements of the latter sort, more particularly when they may react favourably, or unfavourably, on his business.

To have seen one building showing forth by night, with a beauty and distinction which were not appreciable in daylight, was sufficient to stimulate thoughts along the lines mentioned.

Lighting as an Aid to Visibility.

It seemed at once certain that such a movement must grow, if only because of a striking fact which formed a primary observation. It was, that in relative darkness the eye inevitably sees an illuminated object. This seeing is automatic and calls for no effort of will on the part of the observer. The comparatively recent discovery that illuminated letters against a black background are much more telling than opaque letters on an illuminated background, is an example of the same theory.

The needs of commerce alone were, therefore, clearly ground enough for believing that "floodlighting must come."

Further reflection led to the thought that an inevitable development would arise in the illumination of beautiful buildings as public recognition of the possibilities of this new form of lighting grew.

When one thought of the infinite care and expense lavished on the externals of public buildings, with the object of rendering them beautiful, it seemed obvious that "Public Lighting" must one day include such illumination in its field.

To a very large extent hours of darkness are hours of leisure. It, therefore, seemed deplorable that during these hours the beauties of our magnificent buildings should be completely hidden from view. Such a situation might well become intolerable to a public educated to the point of knowing that it could easily be altered. That a public demand for floodlighting would come, the writer has never entertained any doubt. The fact that a few years have sufficed to ensure the inclusion of floodlighting in any scheme of illuminations, is evidence that already the public mind is being formed in the direction indicated.

With such a view of the future, the writer set on foot experiments to determine whether, and to what extent, gas could contribute to the development of floodlighting as a recognised public need.

There were at that time no gas lamps on the market for the purpose, and manufacturers had not grasped the possibilities of the art.

St. James's Park—A Pioneer Installation.

Fortunately the management of the Gas Light and Coke Company, of London, had been thinking along the same lines, and decided to provide gas floodlighting of some of the beauties of St. James's Park, as their contribution to the illuminations during the visit of the International Illuminating Congress in 1931. Only by the generosity of this great company, in placing its resources at his disposal, was it possible for the writer in September, 1932, to undertake the floodlighting of the ancient ruins and floral beauties in the gardens of the Yorkshire Philosophical Society at York.

These grounds form part of the ruined St. Mary's Abbey, and contain not only the ruins of the Abbey Church, but also the famous Roman Multangular Tower.

York possesses a rich heritage of ancient and beautiful buildings which lend themselves admirably to the floodlighter, on account of the grey stone of which they are constructed.

Unequal weathering of stone, causing it to present clean, bright patches, interspersed with dark discoloured areas, provides the floodlighter with certain problems, and may lead to a patchy effect which is unpleasing. In certain cases a good effect as of light and shade is produced, and only by actual trial in each case can the best possible disposition of light sources and quantity of light be determined.

Floodlighting of Ancient Buildings.

In approaching the subject of floodlighting of ancient buildings, the writer would like to make it quite clear that he brings to the subject nothing more than a great love of beautiful things, ancient or modern, and a capacity to be thrilled by a lovely ruin seen by moonlight.

Sir Walter Scott's words, "If thou wouldst view Fair Melrose aright, Go visit it by the pale moonlight," should be in the minds of all engaged upon such work.

As comprehended by the writer, the object is so to illuminate the subject, as to reveal all its beauties while preserving or enhancing that entrancing sense of the mystery and fascination of age worn stone, which inspired Scott at Melrose.

Commercial and Beauty floodlighting are to be regarded as wholly distinct and separate arts in this connection.

The intention of the commercial floodlighter is to make *the* illuminated thing in the eye of the observer. Once this is attained the illuminating engineer has done his work efficiently, and to secure his results, he may well start with the construction and colouring of the object to be illuminated.

Importance of Matt Surfaces.

In passing, it may be mentioned that matt surfaces are required if an object is to be caused to stand out under strong light.

Smooth polished surfaces reflect strong light into the eye of the observer, and strengthening the source of light merely accentuates this effect, which in some instances under the writer's observation is of blinding intensity. Matt surfaces stand out more boldly with every increase in illumination, but without revealing the source of light by the formation of an image; an important point in some forms of commercial floodlighting.

"Beauty" Floodlighting in the sense in which the term is employed by the writer implies the illumination of beautiful objects, such as ancient or modern buildings. Here the shapes and surfaces exist, and the work of the floodlighter is to bring out their beauties. He may not inappropriately be termed the "Floodlighting Artist." Certain it is that the public will see that which he illuminates, literally "In the light" in which he presents it to them.

Were floodlighting carried out under conditions of total darkness, it would be found that a very low intensity of light would suffice. Such conditions are rarely or never experienced, especially in urban areas. Not merely the general light, but isolated points of bright light, affect the eye of the observer and shift the datum (as it were) from which he reckons the relative luminosity or visibility of the floodlighted object.

Order of Intensity Required.

A firm of manufacturers of gas floodlight lamps has published data for the guidance of gas engineers, indicating that the necessary illumination on surfaces lighted varies in the ratio of 3 to 8 for poorly lighted and brightly lighted districts respectively, while the intensity varies between 1 and 10 foot-candles for light and very dark surfaces.

While unable from personal knowledge to confirm these ratios, the writer has found in practice that surrounding light conditions profoundly influence the floodlighting requirements. If in any particular case the public lighting authorities will co-operate by extinguishing or shading public lamps "in the view," it will be found that the effect is greatly enhanced.

On coming face to face with the floodlighting of such an area as the Yorkshire Philosophical Society's grounds, it became apparent that complete illumination was impossible with the number of lamps available to me at that date. Regret on this ground was rendered unnecessary on the early discovery that in such schemes unlighted areas greatly improve the scenic effect, and provide relatively dark viewpoints from which vistas may be obtained.

Figure 2. A View of St. Mary's Abbey.

In this case it was found possible, by spending a little time in selecting viewpoints, to discover pictures that would otherwise be missed.

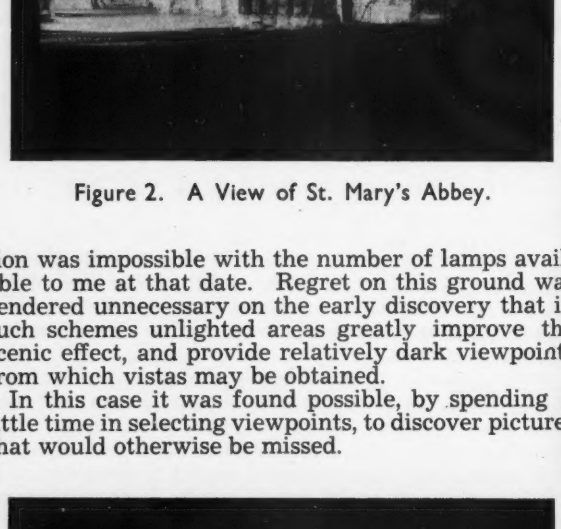


Figure 3. The Museum Gardens; Dahlia Beds and Ruins in the Background.

It is quite a mistake to suppose that a casual stroll round such an area will reveal all the beauties exposed to view. For this reason the writer deprecates undue shepherding of the public while viewing gardens or ancient buildings.

Reference will later be made to an instance in which the public had only themselves to blame, comparatively few seeing a river scene of almost unbelievable beauty, and visible from a public bridge.

From the beginning the writer took the view that the minimum effective illumination should be employed for really old buildings, and he still holds this opinion, though in practice it was found necessary to compromise to some extent with that very large section of the public which seems incapable of appreciating anything but a blaze of light.

Later you will see the beautiful picture of one of the Bars of York. I trust you will agree with me in thinking it beautiful. Yet I had the mortifying experience of hearing a scornful remark, "I could do better than that with a bicycle lamp," made by a spectator during York Civic Week.

The eye is undoubtedly accustomed nowadays to strong light, and in the case in question the adjoining street lamps interfered unless the observer would go to the trouble of seeking a shaded place from which to see the picture.

Attention should be drawn to the special needs of tree illumination. Green surfaces can absorb an enormous amount of light, and leaves of various trees differ greatly in the degree of visibility for a given illumination. The writer would commend the method of illumination of trees from inside a grove, or from the reverse side. In the former case, it is possible with careful placing of projector lamps, to provide vistas of great beauty within a grove of trees. No external illumination can possibly provide such beautiful views, but they are entirely unreproducable in photographs.

In certain cases, and certain conditions of the leaves, the latter are translucent and a tree illuminated from the back, with trunk and branches standing out in startling blackness, is a thing of almost breath-taking beauty and mystery.

When architectural features are to be revealed through windows, doors or arches, the writer considers that the light intensity should, in general, be considerably lower than that employed on the fascia. Special attention should be given to all such cases, for it is possible that the interior view might be such as to justify establishing it as the primary object. which can be attained by suitable lighting.

Impressions gained by daylight are frequently misleading, and the author would rarely trust anything but actual trial under floodlighting conditions to decide on the details of a scheme.

The gas-lamps employed in floodlighting are, for the most part, of the "straight line of mantles" type, with stainless steel reflectors.

The light distribution from such lamps can be varied to a very marked degree, by alterations in the angle of lamp and reflector.

The author has found good results in uniformity and effect from the use of reflectors of the corrugated type, which tend to break up the beam and reduce the liability to form visibly bright belts in the horizontal plane.

Avoidance of spilled light is difficult when the public view is from wide angles, and in certain cases the author has employed shrubs grown in pots. These shield the eye in a less obtrusive manner than shields of iron or wood.

It should be mentioned that the floodlighting was carried out for the Philosophical Society as a commercial proposition, during the visit of the British Association to York in which city it was formed 101 years previously. Public interest was immense, and the society secured a profit from its enterprise.

Figure 4. Bishopsthorpe Palace, Clock Tower.

Attention has been drawn to the fact that the expert arranging the floodlighting determines the view which shall be seen. It follows that in many cases he can build up a picture, bringing into view or leaving out such objects as will assist or injure his results.

A series of five views will be shown to you to illustrate this point. They show the Multangular

Figure 5. Portion of Large Circular Shrubbery.

Tower alone, and the progressive results of illuminating trees in background and foreground, and finally bringing in the gardener's cottage.

One of the pictures shows how, by an alteration of the viewpoint, a balanced picture could still have been presented had the cottage not been suitable for illumination.

Figure 6. Flower Beds and Old Roman Wall.

Experiments were made with special gas mantles, giving so-called "daylight," and red effects, but in neither case was the result so pleasing to the author as the light given by normal gas light when employed on buildings.

Artificial Daylight Mantles.

It should be noted, that gaslighting offers the advantage of artificial daylight effects at very small cost, the mantles employed costing little more than ordinary gas mantles. There are doubtless many cases in which this type of light will be advantageous, and it was employed with excellent results by the Gas Light and Coke Company in the lighting of flower beds in St. James's Park.

Very little expense is involved in making experiments in any instance, in which artificial daylight or redlight may conceivably enhance the effect. Such experiments are very interesting and in conjunction with observation of the effects of alterations in positions, and power of the lamps employed, are very illuminating to the floodlighter.

Present Limitations.

Gas for floodlighting presents certain advantages and suffers from disabilities. Thus, the large radiating surfaces of the gas mantle, relative to the light emitted, render gas light a little difficult to focus so as to throw powerful beams of light. On the other hand, the effect produced by the use of suitable reflectors is excellent for the illumination of large surfaces, when the source of light can be placed well back from the fascia.

Again it is in practice difficult with gas lamps now available, to throw beams of light in a nearly vertical direction, the source of light being placed near to, or attached to, the surface to be lighted.

This latter difficulty may prove not insurmountable, but in the meantime it must be admitted that where the light must in the nature of the case be thrown sharply upwards, gas lighting units are not at present available.

Fortunately, in most instances in the author's experience, it has been found possible to place the lamps opposite the object, and so procure the advantage of a very even and soft illumination, which is very effective by reason of the fact that the angle of vision corresponds nearly with the angle of the rays of light emission.

Examination of illuminated foliage from various viewpoints, strongly brings out this point; for it will frequently be found that by looking along the beam of light, an effect of comparative strong illumination is observed, as compared with that from viewpoints at an angle to the beam.

The author has under experimental conditions placed lighting units as near as possible to the surface to be illuminated, and found the effect displeasing by reason of the violent differences in illumination between different areas of the floodlighted surface.

An example of the effective use of gas lighting by means of high pressure lamps with reflectors placed near the surface illuminated is that of the Birmingham Town Hall. In this case the lamps were situated behind the columns. The lighting effect is remarkably uniform as shown by the photograph, an effect undoubtedly assisted by light reflected from the architrave.

Attention should be drawn to the brilliant success, in this case, of the illumination of interior surfaces. The columns stand out in bold relief, and look much more beautiful than they could possibly have been made to appear by means of external illumination.

There are many examples of commercial floodlighting in which this method is the only one possible, and it is to be hoped that suitable gas lamps for the purpose may soon be available.

Is Coloured Floodlighting Desirable?

The low intensity of brightness of gas mantles also precludes their use with colour screens. The author has found that if a screen sufficiently dense to produce the colour desired is employed, the illumination is insufficient. If on the other hand less dense screens are employed, the colour effect seems to disappear almost completely at the distance necessary with gas floodlighting.

Whether in the lighting of buildings, and more especially of old buildings, coloured effects are to be desired, is a matter of taste. The public eye is undoubtedly becoming educated to demand colour, and there appears some ground for believing that the possibilities of the gas mantle as a source of tinted light have not yet been fully explored.

In the illumination of tall edifices special attention should be given to the lighting of high points.

Not infrequently the author has seen the front of a building beautifully lighted, but the effect has been completely spoiled because the high points have been in total or relative darkness.

The architect's conception may include spires, or towers, to omit which entirely is wholly to destroy the picture. Even when inadequately lighted the effect is improved, but here the floodlighter may actually improve upon the effect hoped for by the architect, by making the high point the "High Spot" of illumination.

The divergence of the beam, and the effect of its angular incidence, conspire to render the proper illumination of very high points somewhat difficult but fairly good results can be achieved with available equipment.

The Convenience of Compressed Gas.

The author would in this connection draw attention to the extraordinary mobility conferred upon gas by the employment of compressed gas in cases of temporary floodlighting. He has found that gas from cylinders, under a pressure of upwards of 80 atmospheres, may be employed without the use of costly pressure regulators.

In June, 1934, an extensive scheme of floodlighting was organised during the Civic Week held in York. The Gas Company and the Electricity Department of the Corporation collaborated in this scheme, which was remarkably successful, and revealed the intense interest of the general public in floodlighting. It was desired to illuminate the Guildhall and public buildings of great beauty, which form an attractive picture when seen from the two bridges spanning the River Ouse. The Gas Company undertook this work, and employed gas cylinders for the purpose.

Boats were moored in the river, carrying cylinders and one or more lamps, 15 12-light strip lamps being employed.

The system worked admirably, no trouble being experienced, and the result may be imagined from the pictures exhibited. Some little difficulty was found in procuring suitable boats, and anyone adopting the same method would be well advised to secure boats which can be relied upon to keep afloat, even during wind and rainstorms. Inattention to this point has resulted in the loss of some cylinders containing coal gas, and these may provide interest to the scientists of some future epoch.

The Guildhall lighting provided an excellent illustration of the necessity of finding viewpoints from which to observe the effect. I hope to show you a view taken from Ouse Bridge, and which I believe you will agree is of startling beauty. Unfortunately, only very few saw this picture, which is incomparably better than that provided from the other bridge, which was thronged nightly.

Figure 7. A charming view of the River Ouse, floodlighted with gas during York's Civic Week, showing the Guildhall and Lendal Tower.

Attention is drawn to the church tower, just visible in this picture. This tower was brought in to balance the picture, and to provide a high point, and was strongly illuminated. In the picture it scarcely shows the actual effect. The photograph was taken in pouring rain, and I am sure you will agree that the photographer to whom I am indebted for this and other pictures shown was remarkably successful under the circumstances.

Photographic Difficulties.

Photographs of floodlighting form interesting mementoes of the occasion, but, in the author's opinion, wholly fail to give the sort of impression received when actually seeing the display. Thinking it possible that they might look better as transparencies, he experimented and found that transmitted light did, in fact, give an effect greatly superior to ordinary photographs. In conjunction with the photographer, Mr. R. L. S. Catcheside, of York, further experiments were made, and it was found that waxing the reverse side of the paper much enhanced the effect.

Finally, the method of printing on special material having a cellulose base, and emulsion coated both sides, the front being "slow" coated, and the back "quick" coated, was adopted. In this manner, really brilliant results were secured, and a selection of pictures produced in this way will be exhibited to you. This material, I believe, is obtainable only from Germany.

NOTES ON INSTALLATIONS.

Some notes on the lamp equipment employed in some of the schemes referred to, or exhibited in photographs, may be of interest.

1. Multangular Tower and Roman Wall.
   Mainly built in gritstone, with later parts in limestone.
   132 ft. wide, 51 ft. high.
   3 12-lt. strip lamps, and
   2 1-lt. beam projectors, placed 30 ft. from frontage.

2. St. Mary's Abbey.
   The stone is limestone and is very light in colour.
   152 ft. wide, 45 ft. high.
   4 12-lt. strip lamps.
   2 1-lt. beam projectors.

3. Yorkshire Museum (frontage).
   Built in sandstone, and rather dark in colour.
   102 ft. wide, 45 ft. high.
   Lamps 42 ft. from frontage.
   3 12-lt. strip lamps.

4. Fountain and Flowers.
   8 1-lt. beam projectors.

   Trees in Same Picture.
   2 12-lt. strip lamps.

5. Dahlia Beds.
   54 ft. Long.
   3 12-lt. strip lamps.
   4 1-lt. beam projectors.

6. Guildhall from River Ouse.
   Built in Magnesium Limestone.
   15 12-lt. strip lamps.
   Gas supplies from cylinders under pressure.

7. St. Peter's School.
   4 12-lt. strip lamps.
   1 10-lt. parabolic beam projector lamp.

8. York Minster, West Front.
   Built in Magnesium Limestone.
   201 ft. high to pinnacles.
   1 10-lt. parabolic beam projector lamp.
   24 1-lt. beam projectors.
   10 12-lt. strip lamps.

9. Leedham's Garage.
   Painted in light colour stone.
   3 12-lt. strip lamps.
   Building 75 ft. wide, 54 ft. high.
   Lamps placed 51 ft. from frontage, 11 ft 6 in. from the ground.
   The lamps could advantageously have been placed nearer the frontage, but local conditions rendered this impossible.

NOTES ON LAMPS EMPLOYED.

The 12-lt. strip lamps consume approximately 13,500 B.Th.U. per hour, but owing to the reflectors employed being other than standard design in many cases, and being regulated and adjusted in situ, the author is unable to give light distribution curves. Greatly differing effects are produced by alterations in the angle of lamp and reflectors.

The 1-lt. beam projectors were made to the author's designs, and were employed for the purpose of reaching distant points, or to provide variation in the illumination for artistic reasons.

Much room for difference of opinion is found when experimentally determining the quantity, disposition, colour, and degree uniformity of illumination to be employed. Only actual experiment "in the field" can decide, and even then unanimity of competent opinion is hard to secure.

The author would like to acknowledge his indebtedness to Mr. R. L. S. Catcheside, for his help in the photographic side, and especially to Mr. A. Holliday, Distribution Superintendent to the York Gas Company, and his staff, without whose devoted and unmeasured assistance and enthusiasm, the work which the author has the honour of describing and displaying to you could not have been carried out.

Figure 8. Bootham Bar and part of the Old Abbey Walls.

DISCUSSION

Mr. R. J. ROGERS (Birmingham) remarked that whilst the author had not gone into any detail with regard to the technical calculations for this class of work he had. in fact, treated the subject in a most interesting way. He was sorry it had not been possible to show a lantern slide of the floodlighting of the Birmingham Town Hall. That building was of the classic style of architecture and when the floodlighting of it was carried out during the visit of the International Illuminating Congress in 1931 it was decided to show the many Corinthian columns in relief. This was done, he thought, very successfully by means of high pressure gas lamps fitted behind the columns, which thus stood out against a lighted background. Later on the Electrical Department carried out a scheme which involved placing the lighting units in front of the columns. He thought, however, that the general view of people in Birmingham was that this method was not so effective as the previous one, in which the columns had been thrown into relief. Continuing, Mr. Rogers read a contribution to the discussion on behalf of Mr. W. J. G. Davey, the Research Lighting Engineer, to his firm, which is summarised at the end of the verbal discussion (p. 42.)

Mr. P. GOOD said he did not think the omission of technical data from this paper need be regarded as in any way diminishing its value, because the presentation of a paper on this subject from the artistic point of view was of very great value. He recalled the difficulties that were experienced in obtaining permits to floodlight public buildings. These difficulties were, however, gradually overcome when those responsible realised that those who were wishing to carry out this work had considerable artistic sense.

Mr. J. G. CLARK also commented on the fact that the author had practically completely ignored questions relating to foot-candles and so on and had dealt with the subject purely from the artistic point of view. There was no doubt. he continued, that whilst we are apt to regard lighting from the utility point of view only it is one of the cheapest things at the disposal of mankind having regard to the pleasure and joy that can be obtained from its use, especially in the manner indicated by the paper. Referring to the floodlighting in St. James's Park in 1931, he said that when he and his colleagues moved the lighting units in an endeavour to improve the aspect they found themselves embarrassed by the many beautiful effects that could be obtained, and that led to the thought that floodlighting, in some cases at any rate, might be under some form of clockwork control so that the lamps could be switched from one direction to another several times during an evening, or from evening to evening, in order to give the public the benefit of the many changes that could be made in that way. The author had rather given the impression that he did not think much of colour effects in floodlighting and he was inclined to agree with that view in many cases. On the other hand. from what the author had shown by placing coloured glasses behind transparencies, it seemed that there were cases in which the effects could be enhanced by the introduction of colour. The use of compressed gas, mentioned in the paper, was an extremely ingenious method of carrying out floodlighting in difficult places so far as gas supply was concerned and it had great possibilities. He could not quite understand, however. how the author had managed to be so successful without the use of pressure regulators and some information on that matter would be interesting.

Mr. C. H. MASTERMAN welcomed the paper for the reason that it drew attention to the opportunities for painting pictures by way of floodlighting effects and also for the fact that it had differentiated between two types of floodlighting, viz., that in which the lighting was merely directed at the front of a building which often gave a patchy and inartistic effect, and the method by which background was taken into account and an entirely artistic effect produced. In other words the light source was the brush and the light was the paint. The difference between the two could be likened to the difference between an artist's picture and a draughtsman's coloured wash drawing. The method adopted by the author enabled a picture to be obtained, perhaps out of quite unpromising material. The author was to be sympathised with in his reference to the manner in which the public in York insisted on looking at certain floodlighting effects from the wrong position. Something of the same kind had happened in the case of St. James's

Park when the public dashed through holes in the railings in every direction and entirely missed some beautiful effects, on the arrangement of which many nights had been spent. The artist at least made sure that his public would view his picture from the front, but the floodlighter had people looking at his picture not only from the back but also walking about in the middle! That was a very considerable problem which it was difficult to know how to overcome. He could not quite make up his mind whether the author was or was not in favour of colour for the landscape type of floodlighting. His own view was that there was such a variety of tints in nature that to attempt to show it by colour in this way was attempting to gild the lily and, indeed, might even vulgarise the whole thing.

At the time of the International Illumination Congress, Mr. Good pointed out the large sums which are spent in improving the amenities of our surroundings, both architecturally and horticulturally, and how this expenditure is, to a large extent, wasted during the hours of darkness—during which hours the majority of the population have more leisure to admire their amenities than during the hours of daylight. A small extra sum spent on floodlighting effects would make possible a return on the large sums spent in the initial outlay. Another advantage also ensued in that, by skilful use of floodlighting, successful effects only need be made visible while blemishes could remain concealed in the darkness.

It was to be hoped that Mr. Bloor's paper would result in added attention being paid to this matter, with especial regard to the possibilities of the romantic type of floodlighting to which he draws attention.

Mr. J. E. AMES (Office of Works) also stressed the need for treating floodlighting more from the artistic than the commercial aspect and specially to avoid patchiness. It was hoped, he said, to carry out some work on floodlighting during the coming year, and every effort would be made to render the results pleasing.

Mr. A. M. BELL said that the first time that floodlighting really came to his notice was during the War when he was in India. The Taj Mahal at Agra is one of the wonders of the world. During the heat of the day in the strong sunlight it is a marvellous white, glittering, almost glaring, spectacle, but at sunset the whole setting changes almost minute by minute to a bright gold, then to a rich gold, and further to a deep red, almost a blood red, whilst in the moonlight it changes again to a beautiful silver. Thus it is possible to see nature's floodlighting in all its glory of varying shades, shadows and colours.

A lesson from nature which he learned then and had since tried to carry out in practice was that high lights should be directed on to pinnacles, etc., and coloured or lesser degrees of illumination on to the lower body of buildings. Never mind foreground in landscape floodlighting, carry the picture in highlights to the tops of trees, for this practice would be found to give far more beautiful effects.

Mr. J. R. HEPPLE (Newcastle-on-Tyne) said he specially appreciated the paper. The author had been kind enough to lend some lamps to Newcastle for two schemes there which were carried out in celebration of the marriage of the Duke of Kent and Princess Marina. In one case—a museum of modern construction with light stone-work—there was little difficulty and it was a great success, but in another case—a church eight hundred years old—there was some difficulty and it was due to Mr. Bloor's help in lending some additional lamps that a good job had been made of it. Many thousands of people visited the church to see the floodlighting and there was a most wonderful effect inside the church due to the light from outside coming through the stained glass windows. There was a record attendance in the Museum on account of the floodlighting, some 4,500 people passing through, the number visiting the church being 3,000. An invitation had now been received to light another church in a similar manner. This was as old as the one already mentioned and the floodlighting would go on from December 24 to 31

Mr. F. C. SMITH said that he thought that Mr. Masterman's division of the subject into romantic floodlighting and commercial floodlighting was a very happy one. Mr. Bloor had succeeded in painting pictures by light and while the paper was being delivered he, the speaker, had entirely forgotten that there were such terms as lumens, etc. He would, however, like to point out that there must of necessity be technical resources behind the man who was to produce the floodlighting picture. It was interesting to look at the photographs that had been shown and try to reflect as to the kind of light distributions that were required to enable the artist to bring about these beautiful effects. One could visualise that in order to secure these effects, projectors providing various types of light distributions must be available to the artist, so that he could choose the one most suitable for his particular purpose. He would like to confirm Mr. Bloor's statement that dahlias were very suitable for this kind of treatment. At the same time, continued Mr. Smith, it might be worth while pointing out that since the St. James's Park installation some technical advances had been made in projectors. Heat resisting mirror glass reflectors had been introduced and the effect of these had been to increase the available light output. Moreover, the modification of certain constructional details had led to improved maintenance conditions. The speaker stated that he had recently had to consider the question of lighting sidings and loco sheds. Projectors had been used for the purpose of lighting the sidings. As is well known, sulphur oxides from the combustion of the coal had a deleterious effect upon polished metal reflectors. He was glad to say that the heat resisting mirror glass reflectors had stood up to the conditions extremely well. Moreover, they were very easy to clean.

Mr. A. CUNNINGTON, whilst agreeing with Mr. Masterman that to try to colour some of these floodlighting effects might be gilding the lily, said that at the same time he was not at all sure there was not some distortion of colour by floodlighting effects. From that point of view perhaps, in special cases at any rate, it might be advisable to introduce a little colour. For instance, the natural effect of some stonework or old dark red brick construction might be entirely spoiled by ordinary floodlighting, and in such cases the use of a colour screen might give a more natural result. Having regard to what Mr. Bell had said concerning the Taj Mahal, it did not follow that the use of colour in a suitable manner would lead to vulgarity. It seemed to him that we had not yet explored the whole story with regard to colour, and personally he was inclined to keep a very open mind on that aspect.

Mr. A. G. BROWN said that the author of the paper, and all those who had taken part in the discussion, had shown very clearly that this Society is definitely concerned with the art of illumination as well as with the engineering of illumination. Mr. Bloor pointed out that in attaining the good floodlighting

results he produced at York City, he was able to ignore intensity calculations and measurements. Under these circumstances he suggested that the Council of this Society should change its name to one which would more accurately describe its true field of activity. To limit the scope of the Society to Illuminating Engineering and exclude artistic illumination would seem to be undesirable, and one might almost say narrow minded. The Society had a Technical Committee which studied scientific developments, why should it not have an Art Committee whose task would be to keep the engineers from infringing the laws of Art? In conclusion, as a member of the electrical industry, Mr. Brown congratulated Mr. Bloor on a very interesting paper.

Mr. J. H. BURMAN commented on the wonderful flexibility of the method which the author had described and congratulated him on his excellent artistic sense in bringing out vital points which were often not noticeable even in the daylight to many people. He had been impressed with the manner in which the author had in nearly every case suppressed the unnecessary, and particularly the foreground, always the most difficult and disturbing portion of a view, and had brought forward those things which really make a picture. There was also the beautiful manner in which the author had overcome the difficulty of a black background by producing gradations of tone and avoiding harshness and too much light where it was undesirable, all of which went to make up a good picture.

Mr. W. G. DAVEY, in a written contribution, complimented Mr. Bloor on his paper. Floodlighting, he pointed out, was at once a science and an art. The designer of floodlighting installations, in preparing his scheme, needed data in regard to the number of units and their characteristics. In this respect he resembled the architect who, in putting his artistic conceptions on paper, did not hesitate to use set square and compasses, or the artist who was concerned with the material used for his pictures. Whilst it was necessary to know the lumen-output of lamps and similar technical data the actual focusing and positions of lighting units must necessarily be left to the artistic discernment of the man on the spot. He wished to endorse Mr. Bloor's claims on behalf of floodlighting as a means of revealing, during the hours of leisure, what few people had opportunities of studying by day. He had often heard the remark, "I did not realise how beautiful that building was until I saw it floodlit." The special merits and difficulties attendant on the use of gas for floodlighting had been discussed. Units were now being developed to give a much greater vertical throw and the possibilities of downward direction of light from units mounted on roofs were not being overlooked. It was admittedly difficult to focus light from a gas mantle and thus produce a very powerful beam of light. He believed, however, that in treating buildings and gardens, wherever beauty rather than spectacular effect was desired, the alignment type of floodlight gas lamp had no equal. In achieving artistic floodlighting daylight should not be imitated. The object illuminated should be revealed by contrast. The searchlight effect produced by a very powerful beam striking a light-coloured object had a blinding effect, similar to that produced by the sun's rays reflected from snow-covered ground or from the surface of a pool, the edges of which were in deep shadow. The darkness of surrounding objects enabled a beam of comparatively low intensity to produce beautiful effects and made it possible to discover the hidden attractions of a building or garden, where a powerful beam might dazzle and spoil the appearance. From the aesthetic standpoint nothing was gained by showing up the cracks in mortar and the blemishes of an old ruin. Artistic effect lay in veiling such defects whilst emphasising by contrast the architectural symmetry of a building or throwing into relief the natural beauty of leaf and flower.

Mr. BLOOR, replying to the discussion and expressing his appreciation of the manner in which the paper had been received, mentioned that the Mansion House, which formed one of his illustrations, had, according to a book recently published, been lighted on the front as far back as 1839 in connection with some celebrations. Open gas flames and tubing were used, but it was described at the time as floodlighting. Speaking generally on the newer outlook on floodlighting which he had endeavoured to bring out in the paper, he stressed the point that personal taste enters very largely into it, and that introduced certain difficulties. For instance, he had certain views on the use of colour which might not be shared by others. As an example, he had seen a War Memorial coloured with three vivid colours, which did not strike him as being in good taste, but, evidently, the man who did it thought so. The suggestion made by Mr. Clarke with regard to changing the view from time to time was well worth further consideration, and arrangements might be made to revolve the light in order to give a different aspect, because undoubtedly some very striking results could be obtained by a slight alteration of the lighting. As a matter of fact, that happened in practice now owing to the different atmospheric conditions from night to night. At the same time, the idea of altering the view two or three times, say, during an evening had never occurred to him, and it certainly would add interest. On the question of the pressure regulator, obviously this would be necessary if more or less permanent use were made of the cylinders of compressed gas at, say, 80 atmospheres; but it should be noted that the paper referred to temporary use, and in such circumstances it had been found that over a few evenings, or even a week, the attendants in charge of the installation could regulate the pressure sufficiently by hand. In connection with Mr. Hepple's remarks, Mr. Bloor said that in regard to church lighting he hoped to carry out some work which would be different from anything yet done, viz., to floodlight from the inside so that the light would be seen through the stained-glass windows from the outside showing the windows as pictures. The effect was incredibly beautiful. Mr. Masterman had made use of a delightful remark when he spoke of "romantic floodlighting," and with the right type of subject some of the effects were truly amazing. The sensation of creation was something to be experienced to be appreciated, and it was very satisfying and very pleasant. There were many aspects of this matter about which more knowledge was desirable, perhaps, but, after all, he doubted whether Michael Angelo knew anything about the chemistry and physics of the colours he used. He just painted his pictures with the materials he had, and with men like Mr. Masterman and his assistant always so ready to give help there should be no difficulty in others carrying on with this work in their respective districts on the lines set forth in the paper. At the same time, if a success was to be made of it, even with the technical assistance he had mentioned, it was necessary to spend a considerable amount of time beforehand in endeavouring to secure the best arrangement. He himself had found that this paid well in the long run, and it was what Mr. Holliday and himself had done.

The meeting closed with a cordial vote of thanks to Mr. Bloor.

Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

(Continued from page 16, January, 1935)

I.—RADIATION AND GENERAL PHYSICS.

33. Eyesight with Yellow Light.

Nature 134, p. 1000, December 29, 1934.

J. E. Ives in the United States Public Health Report No. 1,640, reported the following experiments. Two groups of clerks each about a dozen in number. worked four hours a day for three months at their usual tasks, one group with an illumination of 10 f.c. of light from gasfilled tungsten lamps, and the other with 10 f.c. of light from sodium vapour lamps. There was no difference in the amounts of work done by the two groups. Periodical clinical examination of the eyes of the subjects showed that no detectable permanent effect on the eyes was produced by the sodium lamps. T. H. H.

34. Suggested Use of Red Filters for Improving Vision.

Nature 134, p. 1000, December 29, 1934.

In the *Klinische Wochenschrift* (November 3), Arnold Berliner advocated the use of a red filter, for improving vision when the media of the eye are hazy as from vitreous opacities, incipient cataracts, etc., since in such media, light of short-length is scattered more than that of long wave length. T. H. H.

35. Vision in the Ultra-Violet.

W. d Groot. Nature 135, pp. 68-69, January 12, 1935.

Gives curves expressing results obtained with a large number of observers, which show that the ratio of the visibility of the 313 μ mercury line to that of the 405 μ line remains, for an average observer, constant between the ages of twenty-five and thirty, at a value of about 1/1,000. As the age of the average observer progresses from thirty to forty-five, the above ratio decreases to less than 1/1,000,000, in agreement with recent statements by Professor Fabry. This behaviour at the extreme ultra-violet end of the visibility curve is quite unrelated to the Ives Yellow-Blue ratio test. This last fact indicates that the question of vision in the ultra-violet is more determined by accidental properties of the eye (colouring of liquids) than by a certain disposition of receptors. T. H. H.

36. An Ultra-Violet Microscope for the Examination of Opaque Objects.

B. K. Johnson. J. Sci. Inst., xi., 384, December, 1934.

The paper describes work which has led up to the design of a special form of microscope for the examination of opaque specimens in ultra-violet light. The following matters are discussed: the design of the optical system, the ultra-violet transmission of suitable materials, the ultra-violet reflecting power of certain metals, the fine adjustment, and the instrument in use. S. E.

II.—PHOTOMETRY.

37. Work of the Institute of Metrology and Standardisation of the U.S.S.R. on Standards of Light, 1930-1932.

Anon. R.G.E. 22, pp. 780-782. December 1, 1934.

An account of work done in Russia on standards of luminous flux and brightness. For brightness standards, test-plates subjected to a known illumination have been used. W. R. S.

38. Comparative Photometers.

Anon. Elect., 114, pp. 37-38, January 11, 1935.

A brief description, with a photograph, is given of a new comparative photometer intended for quick approximate comparison of similarly rated lamps. C. A. M.

39. A New Photometric Method in Optical Spectral Analysis.

S. P. de Rubies. Zeits f. Phys., 92, pp. 228-231, 1934.

In this method, one photographs the spectrum on several separate photographic films placed one on top of each other. The degree of blackening for a given wave-length is determined for each of the films, and the logarithmic sum is found. With the latter, the curve corresponding to the total blackening is obtained. This method for quantitative analysis allows the use of the most probable as well as the fundamental lines of the elements, and of stronger concentrations of the elements. T. H. H.

40. A New Graphical Method of Calculating the Natural Lighting of Rooms with Rectangular Windows.

A. Daniljuk. Das Licht, 241, December, 1934, and January 16, 1935.

Two charts, one with polar co-ordinates and the other with mixed co-ordinates (horizontal lines and radial angles) are used in this method. Their use in working out indoor illuminations is illustrated by examples. S. E.

41. British Standard Specification for Photo-electric Cells No. 586—1935.

This specification relates to cells of the emission type for sound film apparatus. Tabular data relating to dimensions are presented. The prescriptions deal with such properties as working voltage, colour temperature, ageing process, minimum sensitivity, maximum change in sensitivity, uniformity of sensitivity, maximum slope, maximum dark current, frequency response and light flux incident on cell. J. S. D.

III.—SOURCES OF LIGHT.

42. Applications of Electric Discharge Lamps in Industry.

R. O. Ackerley. World Power, 23, pp. 12-16, January, 1935.

A discussion is given, with photographs, of the present-day use of electric discharge lamps in industrial lighting. C. A. M.

43. A New Architectural Lamp.

Anon. Elect. Rev., 115, p. 749, November 30, 1934.

A new type of tubular architectural lamp is described. It can be made in lengths of about 7 feet. The filament is supported on a flexible chain of mica. C. A. M.

44. New Sources of Ultra-violet Radiation.

J. Roger. Lux, No. 9, p. 138, November, 1934.

Various sources of ultra-violet radiation such as arcs, mercury vapour lamps, and incandescent lamps containing a globule of mercury, are described and illustrated. Photographs are presented showing the nature of their spectra. Their consumption, luminous efficiency, life, and other characteristics are tabulated. J. S. D.

IV.—LIGHTING EQUIPMENT.

45. British Standard Specification for Translucent (Diffusing) Glassware Illumination Fittings for Interior Lighting. (No 324—1934.)

This revised specification was issued in November, 1934, and deals with such matters as rating and dimensions, thermal endurance, brightness, non-visibility of light sources and light output ratio. A minimum brightness of five candles per square inch is prescribed, and

light ratio output is indicated by aid of a special formula and table. Directions for testing thermal endurance, light output ratio, and brightness are appended. J. S. D.

46. British Standard Specification for Neck and Flange Dimensions of Illumination Glassware and Carriers. (No. 364—1934.)

This specification, as revised, was issued in November, 1934. The dimensions are designed to ensure that glassware and carriers shall be interchangeable. Tabular data for glassware used with both gas and electric lamps are presented. J. S. D.

47. Multi-Point Control for Flexible Lights.

Anon. El. World, 104, p. 1186, December 22, 1934.

The article describes the system employed at the Edison Institute Museum at Dearborn, Mich., whereby the whole of the lighting load of the main exhibition room (of nearly 900 kw.) can be controlled by means of four double push-button switches from any one of five points. S. S. B.

48. New Lighting Equipment at the University of Texas.

J. L. Tugman. Light, 3, No. 7, pp. 15-25, December, 1934.

Numerous photographs are given showing new lighting equipment recently installed in buildings at the University of Texas. C. A. M.

49. Pedestrian Operated Traffic Control Signals.

Anon. World Power, 23, pp. 30-31. January, 1935.

Details are given, with photographs, of traffic signal equipment adapted for pedestrian control. C. A. M.

50. Merrill's Voltage Indicator.

G. S. Merrill. Light, 3, No. 7, p. 2. December, 1934.

A brief description is given of a photo-electric device for the measurement of voltage in lighting installations. A carbon lamp is employed with a conversion scale giving the standard relation of illumination values and voltage.

V.—APPLICATIONS OF LIGHT.

51. The Year's Progress in Illumination.

W. C. Brown. Am. Illum. Eng. Soc., Trans. XXIX., pp. 755-778, November, 1934.

A detailed description of the year's progress in illumination in the United States. G. H. W.

52. Light and Architecture.

Am. Illum. Eng. Soc., Trans., XXIX., pp. 737-746, November, 1934.

Illustrated descriptions of eight modern lighting installations. G. H. W.

53. Architectural Lighting.

R. O. Sutherland. Elect. Rev., 116, pp. 43-44, January 11, 1935.

In a discussion of architectural lighting, two novel lighting features are dealt with in some detail. C. A. M.

54. Architectural Lighting.

G. Canesi and A. C. Ramelli, L'Illuminazione Razionale, December, 1934, XIII., No. 12, pp. 230-231.

A review of a work by the above authors, illustrated by striking views of modern installations and original designs of fittings. J. S. D.

55. Characteristics of Modern Residence Lighting.

E. W. Commery. Gen. El. Rev., 37, pp. 566-9, December, 1934.

Recommended illumination values for the home are given, together with descriptions of suitable portable lamps for home lighting. Two new filament lamps for indirect and semi-indirect floor standards are described. G. H. W.

56. Indirect Lighting of Prismatic Glass Ceiling.

M. Cohu. B.I.P., VIII., p. 12, January, 1935.

Illustrates an unusual installation. Indirect fittings illuminate a curved ceiling built up of prismatic glass elements, which serve both to admit daylight and to reflect the artificial light downwards. J. S. D.

57. Better School Lighting Pays.

H. L. Johnston. El. World, 104, p. 1078, December 8, 1934.

The article reports a test made in an American school on the importance of good lighting in classrooms. An improvement of 28 per cent. in progress of pupils (Pressy and Metropolitan tests) was found in the classroom in which adequate controlled lighting was provided. S. S. B.

58. Local Lighting.

Anon. Elect., 113, p. 841, December 28, 1934.

A new low-voltage localised lighting system for machine tools and similar plant is described. Portable handlamps, flexible brackets, etc., are each fitted with a step-down transformer of 48 watts, loading at voltages ranging between 12 and 50 volts. C. A. M.

59. Street Lighting.

J. Schaer. Das Licht, p. 225, December, 1934.

It is contended that the most important consideration in street lighting and motor road lighting is freedom from glare. Photographs of installations of sodium lamps, in which glare is present in varying degrees, are reproduced to support the argument, which naturally leads up to the experiments that are being made in Germany with unidirectional road lighting from low posts, the light being projected as a flat beam in the same direction as the moving traffic. S. E.

60. Street Lighting in Ireland.

F. X. Algar. Elect. Rev., 115, pp. 825-826, December 14, 1934.

A summary, in some detail, is given of a paper read by the author to the Institution of Civil Engineers of Ireland, dealing with present-day street lighting in the Irish Free State. C. A. M.

61. Indirect Street Lighting at Innsbruck.

F. Pichler. Das Licht, January, 1935.

Hertzog—Friedrich Strasse—a street of historically and aesthetically interesting houses, has been illuminated, as an experiment, in a way calculated to show up the beauty of the housefronts by night. Ordinary street lighting is dispensed with, and replaced by an indirect system, employing floodlight units, mounted on the roofs of the houses on both sides of the road, and trained so as to light up the façades from the top downwards to within about 8 or 10 feet from the ground. The floodlights are therefore ordinarily not visible. It is claimed that the roadway is illuminated to a sufficiently high level by reflection from the walls, and that the experiment is justified both on technical and aesthetic grounds. S. E.

62. Street Lighting, Traffic, and Safety.

R. E. Simpson. El. World, 104, pp. 1162-1163, December 22, 1934; Das Licht, p. 237, December, 1934; Trans. Ill. Eng. Soc., U.S.A., 1933, p. 651.

A brief report is given of an investigation into the relation of street lighting to the number of road accidents. The survey covers a period of three years, data being obtained from thirty American cities. S. S. B.

63. Railway Yard Lighting.

T. L. Wagner. Das Licht, January, 1935.

Various methods of lighting railway yards are discussed, in particular relation to railway workers' requirements. The use of high-power floodlights, mounted on masts 30 metres high, is compared with the older method, employing numerous opaque reflectors, very much to the advantage of the floodlight system, both as regards suitability, cost of installation, current consumption, and replacements. The floodlighting system employed at the West India Dock is described and illustrated. S. E.

64. Store Lighting.

J. W. Fleming. Light, 3, No. 7, pp. 28-29, December, 1934.

A description, with a photograph, is given of an installation in a jeweller's shop, in which an illumination value of 60 foot-candles was obtained on show cases. C. A. M.

65. Sodium Lighting at a London Store.

Anon. El. Times, 86, p. 770, December 13, 1934.

Messrs. Austin Reed, of Regent Street, have recently installed 56 Sodium Discharge Lamps to floodlight the upper windows of their building from the inside. W. R. S.

66. Three-Second Selling by Show Window Lighting.

J. M. Ketch. El. World, 104, p. 1190, December 22, 1934.

This short article emphasises the importance of display lighting in attracting custom, and makes some suggestions for obtaining the best results. S. S. B.

67. Floodlighting Industrial Buildings.

Anon. El. Times, 86, p. 731, December 6, 1934.

A photograph of a floodlit Silo at Cork, to show the imposing appearance of modern square-style buildings under judicious lighting. W. R. S.

68. Floodlighting at Lincoln.

Anon. El. Times, 86, p. 713-714, December 6, 1934.

Gives photographs and a description of floodlighting of old buildings, including Lincoln Cathedral. W. R. S.

69. Celebration Illuminations.

Anon. El. Times, 86, p. 731, December 6, 1934.

Gives photographs and a description of floodlighting carried out in London and Scotland. W. R. S.

70. Il Duome di Pisa.

E. Rajmondi. L'Illuminazione Razionale, XIII., No. 12, p. 236, December, 1934.

An illustrated description of the floodlighting of the famous leaning tower of Pisa. J. S. D

71. Gala Lighting.

Anon. Light, 3, No. 7, pp. 6-7, December, 1934.

A brief description is given, with numerous photographs, of recent gala lighting in Milan. C. A. M.

E.A.W. Activities in 1935

An excellent programme for 1935 has been prepared by the Electrical Association for Women. At the opening gathering of the Demonstrators' Circle, on January 21, Miss C. Haslett spoke on "What of the Future?" (a very pertinent enquiry!), and on March 11 Mr. S. W. Hamlyn is to lecture on "Modern Lighting Design." Other topics include "Electric Clocks," "The Application of Electricity to Agriculture and Horticulture," and "Showroom Display." The London branch programme includes a talk and demonstration of theatre lighting by Mr. F. P. Bentham on March 19, whilst for the Teachers' Circle Mr. W. J. Jones is to lecture on Illumination by Electricity.

A New Lighting-up Time-Table based on Illumination Requirements, by G. H. Wilson

("Illuminating Engineer," Vol. 27, p. 369, November, 1934)

A CORRECTION

Mr. Beveridge, of Edinburgh, has kindly drawn attention to an arithmetical error in lines 14 and 16 of the second column of page 369 of Mr. Wilson's paper. The sentence concerned, which deals with the total number of burning hours, should be corrected to read:—

"The annual total in latitude 58° N. is approximately *sixty* hours less than at latitude 54° N., and in latitude 50° N. it is approximately *forty* hours more." The corrections are shown in italics.

Mr. Wilson would also like to take this opportunity of giving a reference to an earlier paper in which data are given on daylight illumination values occurring round about the times of sunset and twilight. The reference is "Daylight Illumination and the Intensity and Duration of Twilight," H. H. Kimball, Am. Illum. Eng. Soc., Trans. Vol. XI., 1916, pp. 399-413.

The Illuminating Engineering Society

Silver Jubilee Commemoration (1934) Award

The above Award, instituted for the first time this year, is open to members of all classes and affiliated students under the age of twenty-six years.

Entries, presenting papers, or records of designs, researches, or investigations, as defined below, should reach the Hon. Secretary before the end of May, 1935.

The conditions under which the Award is made are as follows:—

1. A Silver Jubilee Commemoration Award shall be available every year, unless otherwise determined, for a Member, or Associate, or an Affiliated Student of the Society, who is under the age of twenty-six years on the date of his qualification for the Award.
2. The Announcement of the Award for the previous Session shall be made by the President at the Opening Meeting of the next Session of the Society.
3. The Award shall consist of:—
   (a) An inscribed Diploma, stating the reason of the Award, signed by the President and Honorary Secretary.
   (b) The sum of Five Guineas by a cheque drawn on the Society's Bankers.
4. The Qualification shall be the accomplishment of any of the following tasks:—
   I. The presentation in writing to any Technical Society or Association, approved by the President, of a paper dealing with the theory or practice of Illuminating Engineering.
   II. The design and/or construction of a novel instrument or appliance for use in connection with an application of, or research concerning illumination.
   III. The carrying out by the applicant of an investigation beneficial to Illuminating Engineering.
5. The decision as to the recipient of the Award is to be in the discretion of the President, acting with the advice of the Council.
6. In the event of no response of sufficient merit being forthcoming in any Session no Award in respect of that Session shall be made.

Recent Patents

(Abstracts of recent Patents on Illumination & Photometry.)

No. 419,594. "Improvements in Miners' or the like Safety Lamps."

Hailwood, E. A., February 15, 1933.

This specification covers an attachment for safety lamps for collecting and directing air from a current in any direction into the air channels and dome of the lamp, thus to prevent smoking and flickering of the lamp in draughts. The attachment comprises baffles which prevent back-draught and vacuum effects.

No. 419,627. "Improvements in Gas-Filled Incandescent Lamps."

N. V. Philips Gloeilampenfabrieken, October 7, 1932 (*Convention, Holland*).

In order to minimise the pronounced blackening effect of tungsten deposited upon internally frosted gas-filled lamp envelopes, a substance such as NaCl, KBr, KI, Na_2WO_4, $Na_2W_2O_7$, or SiO_2 is included and renders the tungsten deposit invisible. The substances have less or practically no effect in smooth envelopes.

No. 419,653. "Improvements in Street Lighting Apparatus."

Holophane Limited (*Communication from Société Anonyme Français Holophane*), *May* 28, 1934.

In order to provide a non-dazzling street lamp giving a good distribution of light with little above the horizontal from a vertical linear source, a virtual horizontal source is produced by means of two mirrors inclined at 45° to the axis of the source and forming between them a dihedral, the ridge or apex of which intersects the axis of the source. Several such arrangements are described.

No. 420,028. "Improvements in or relating to Electric Light Fittings."

The General Electric Company, Limited, and Waldram, J. M., October 20, 1933.

This specification describes a diffusing electric light fitting comprising a pair of diffusing translucent surfaces, one within the other, and a downwardly directed reflecting surface formed by the upper conical portion of a unitary envelope in the form of a cone with a base which is not necessarily flat, the lower portion of this envelope forming the outermost diffusing surface.

No. 420,463. "Improvements relating to Optical Projection Apparatus."

Chance Brothers and Company, Limited, and Hampton, W. M., September 14, 1933.

This specification relates to projectors intended primarily for illuminating aerodromes at night and for casting a shadow to protect the pilot of a landing aircraft from glare without interrupting the illumination of the ground. A shadow bar is combined with a reflector flood-light instead of with a dioptric flood-light. The reflector is wholly or partly of parabolic form in vertical section, but is wholly or partly of circular form in horizontal section.

No. 420,575. "Improvements in Electric Gas-Filled Incandescent Lamps."

N. V. Philips Gloeilampenfabrieken, July 10, 1933 (*Convention, Holland*).

This specification proposes a gas-filling for incandescent lamps consisting of krypton or xenon with from 10 per cent. to 30 per cent. of nitrogen at a pressure of between 25 and 45 centimetres of mercury or more.

No. 420,783. "Improvements in Electric Lamps and the Like."

The British Thomson-Houston Company, Limited, April 15, 1933 (*Convention, U.S.A.*),

According to this specification instead of the glass envelope of an incandescent lamp or the like being hermetically sealed with leads sealed through the walls, the internal filament or like assembly and its supports and leads are assembled upon a base with a metallic shell, which may form one contact, and with an exhausting orifice. This base is sealed over an opening of the glass bulb and, after exhaustion, the orifice is sealed. The base itself thus forms a part of the envelope. It may be in the form of a screw or bayonet cap.

No. 420,841. "Improvements in Electric Incandescent Lamps."

de Backer, L. F., February 2, 1933 (*Convention, Belgium*).

According to this specification a reflecting layer of silver is applied over an annular portion of the interior of the neck of a clear glass electric lamp bulb to provide a reflecting surface. The layer or coated part of the surface may be faceted.

No. 420,854. "Method of making Incandescent Filaments for Incandescent Lamps or Discharge tubes."

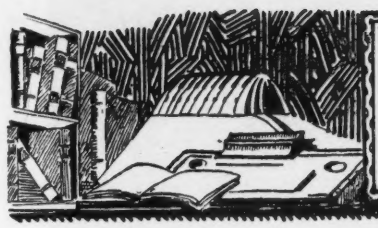
N. V. Philips Gloeilampenfabrieken, January 11, 1933 (*Convention, Germany*).

This specification relates to "coiled-coil" filaments for electric lamps, etc., i.e., filaments consisting of wire coiled into a helix which is itself coiled into a larger helix. According to the specification neither the ratio of the internal diameter of the initial helix to the diameter of the wire, nor the ratio of the internal diameter of the final larger helix to the overall diameter of the initial helix exceeds 2.1. 60 watt lamps with filaments having the first mentioned ratio equal to 1.75 and the second ratio equal to 2.10 gave results in shock tests about five times as good as similar lamps in which the ratios were 2.65 and 2.70 respectively.

No. 420,926. "Improvements relating to Reflectors for Artificial Lighting Purposes."

Revo Electric Company, Limited, and Reeves, F. H., July 21, 1933.

This specification describes a lamp fitting of semi-circular, arcuate or tunnel-like form comprising a reflector of silvered glass or polished metal, faceted on both outer and inner sides correspondingly, which is held in a semi-circular or arcuate metal cover by waterproof cement which engages the faceted outer surface of the reflector.



REVIEWS OF BOOKS AND PUBLICATIONS RECEIVED

Seeing and Human Welfare.

M. Luckiesh, D.Sc., pp. ix. + 183, plates 8. (Ballière, Tindall and Cox, London, 1934.)

This book conveys, in a popular form, the author's ideas in regard to the influence of conditions of illumination on powers of perception or seeing. In Chapter I.—"A Half-Seeing World"—Dr. Luckiesh stresses the fact that the human make-up—our bodies, sense-organs, and even mental life—are really the product of outdoor experience during the evolution of man. Under artificial light we are trying to manage with degrees of illumination far less than those met with in full daylight, when as much as 10,000 foot-candles may be attained. In subsequent chapters he analyses the Human Seeing Machine and The Science of Seeing—the latter a much more intricate process than the mere formation of an image on the retina. In particular, the duration necessary for appraisement of things we see is of importance. The influence of better lighting may be seen in greater speed and enhanced ease of perception. In an instructive chapter the four factors of primary interest in connection with vision (size, contrast, brightness, and time) are discussed, and other influential factors, less directly associated with the eye, are mentioned. In Chapter V. ("Eye-Defects of Age and Usage") Dr. Luckiesh traces the development of the visual powers from infancy to adult life, and he presents figures to illustrate the familiar but regrettable fact that human vision, having reached a certain stage, so often declines throughout school life and subsequent adult experiences. It is admittedly difficult to prove that inadequate lighting is responsible, but the author asks why, when other powers develop normally and progressively, eyesight deteriorates? Impressive, also, is his record of percentages of defective eyesight amongst persons of different occupations, less than 20 per cent. for hunters, sailors, policemen, and labourers, and as much as 80 to 100 per cent. for teachers, book-keepers, tailors, etc. Industrial researches have frequently shown an apparent maximum of efficiency with illuminations of 10 to 30 foot-candles. It is suggested, however, that very much higher values are often necessary for complete powers of seeing to be obtained. The author suggests a series of minimum values ranging from 0-5 candles up to 100 foot-candles or more for very severe tasks.

The Practical Electrician's Pocket-Book.

(Odhams Press, London, 1935; pp. 591 + 1.)

The thirty-seventh edition of this pocket-book remains a miracle of condensed information, offered at a very reasonable price for the number of pages (nearly 600) of reading matter. As usual, the matter has been extensively revised. A new chapter on traffic signalling has been introduced, and the measurement of noise is dealt with for the first time. Another new feature is the review by Mr. A. P. M. Fleming of electrical progress during 1934. The sections on photometry and illumination might now be remodelled with advantage. It seems anomalous, for example, that illumination photometers (especially those of the photo-electric type) and electric discharge lamps should not be mentioned, though it is true that a brief reference to the latter occurs in Mr. Fleming's review.

Neon.

S. Gold, 178 pp. + ix. (Crosby, Lockwood and Son, Ltd., London, 1934.)

There is, as the author truly states in his introduction, "a dearth of technical information on neon." Therefore works on this subject are welcome. In this case the author's aim is not primarily to deal with the technicalities of production of neon tubes and their performance, but rather to present practical information likely to be of value to the salesman or user. A somewhat unusual method of presenting information has been adopted, subject-matter being treated in a series of fifty-five short sections, instead of by chapter, and the sequence of information seems in certain respects a little chaotic. Thus the manufacture of tubes is dealt with in sections 2, 37, and 45, whilst "conduction of electricity through gases," an elementary and introductory item that might be expected to precede description of results, is treated in section 38. It would appear, however, that the intention was to deal first with the more practical points, and to present the more scientific and technical data at the end of the book. In the fifty-five sections of the book a great variety of topics is touched upon, and a considerable amount of useful information is included. Such points as types of signs and form of letters, regulation for fixing, current consumption and life, low-tension wiring, correction of power factor, methods of control, common faults, calculation of footage, and estimates are touched upon. The author is concerned with neon tubes primarily as implements for signs rather than for purposes of illumination. This perhaps explains the apparent lack of information on candle-power, brightness, and efficiency. We notice (p. 21) a statement that the penetrative power of light varies as the twelfth power of the wave-length. This hardly seems in accord with recent tests of the influence of colour in connection with motor headlight beams. One suspects, however (as the author elsewhere discusses the selection of diameter of tube according to the colour of light) that this rule may be intended to apply to visibility of the sign at a distance, a problem that introduces other factors besides fog-penetration. One section (44) deals briefly with the hot cathode tube. Doubtless in a subsequent edition more may be said on this topic, and on the applications generally of tubes containing luminescent gases for purposes of illumination. A glossary of technical terms and an index figure appear at the end of the volume.

The Gas Journal Calendar and Directory.

(Walter King, Ltd., London, 1935; pp. 236 + xxxvi.)

This year the "Gas Journal" Calendar and Directory makes its fifth appearance. The Almanack, as usual, contains serviceable information. In the Directory the statistical data relating to Gas Undertakings continue to form the main item. Part IV. (Public Lighting Superintendents) is a valuable item, which is, we think, unique. The Trade Section seems more comprehensive than ever, and the Handbook to cover almost all fields of interest to gas engineers. The table (p. 216) showing the growth of the gas industry in Great Britain should be regarded as encouraging. Our only criticism of this section is the apparent absence of adequate data on lighting by gas.

A Photo-Electric Street-Lighting Photometer

(Communicated.)

The measurement of street lighting illumination *in situ* is one of the most difficult of photometric problems owing to the low illumination to be measured, so low as to make a visual balance largely a matter of personal opinion, and the high angle of incidence at which light reaches the test surface, which can no longer be relied upon to follow the cosine law. To this difficulty must nowadays be added the possibility of a wide difference of colour between the comparison lamp in the photometer and the mercury, sodium, neon, or other light source to be measured.

The application of the photo-electric principle to the street-lighting photometer thus presents evident advantages, but until recently it had not been found possible to obtain sufficient sensitivity nor to avoid the great departure from the cosine law exhibited by the sensitive surface.

Quite recently, however, Messrs. Everett, Edgcumbe and Co. have applied their "autophotic" cell to this purpose. The Holophane-Edgcumbe street-lighting photometer developed by them possesses some remarkable properties. This photometer is normally provided with three ranges of 0-0.3, 0-3, and 0-30 foot-candles, with the addition of a fourth

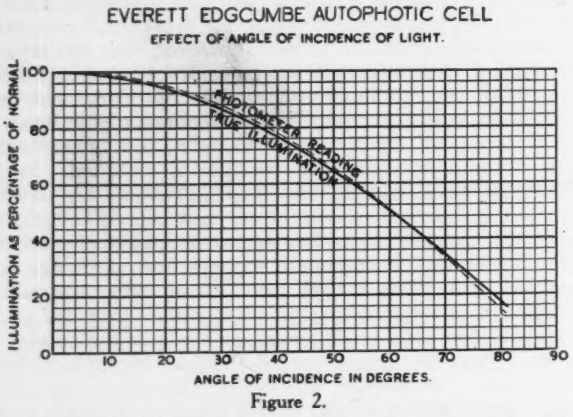


Figure 2.

range of 0-150 foot-candles, when desired. The scale is 4½ in. long, is direct-reading in foot-candles, and is evenly divided throughout its length. Thus illuminations as low as 0.005 foot-candles (half the lowest minimum figure dealt with in the B.S.I. Street Lighting Specification) can be accurately read.

Fig. 1 shows the instrument in use in the street. Its convenience compared with the visual comparison pattern, which has to be held to the eye of the observer, is evident. A valuable feature is that the scale is internally illuminated from a self-contained torch battery so that it can be clearly read, even in the dark. The measuring instrument proper consists of a sensitive moving-coil, carried by a taut double suspension, which both forms the controlling force and affords an elastic support for the moving parts. These latter are extremely light and the movement is perfectly dead-beat in action.

The "autophotic" cell forms an ideal test surface since, as illustrated in Fig. 2, it follows the cosine law very closely indeed. The sensitive surface was held normal to the rays of light and the illumination adjusted to 10 foot-candles. The test surface was then turned through 5° at a time and the readings on the photometer scale noted. In the figure the full curve shows the true illumination and the dotted curve that indicated on the photometer scale. The very close agreement is evident; in fact, up to an angle of 75° with the normal (the largest angle of incidence at which, according to the B.S.I. Specification for street lighting, illumination should be

Figure 1. General Appearance of Photometer.

measured) the divergence is negligible. If the angle of incidence exceeds this value normal readings should be taken and the horizontal illumination calculated from them.

Another important question for street-lighting work is the suitability of the photometer for use with light of different colours. Here, again, the "autophotic" cell is particularly valuable in having a colour sensitivity curve analogous to that of the normal human eye. Fig. 3 shows the curve for the cell, and it may be added that arrangements are made in the photometer to compensate for such divergences as exist. Thus, when using the photometer for electric lamps, gas lamps, or even mercury or sodium lamps, or daylight, the scale is still direct-reading in foot-candles.

For many purposes it is sufficient to place the test surface on the ground; but it is often essential to be able to set it at some definite angle with the horizontal and at the same time to determine the angle made by the rays of light reaching it from the principal sources. A compact universal test surface carrier has accordingly been designed which enables both these measurements to be made and which can either be placed upon the ground or carried upon a light tripod.

The size of the complete photometer is 11 in. x 7 in. x 5 in. and the weight some 7 lb. The case may be locked, and when closed all switches and controls are completely closed in so that interference by unauthorised persons is impossible.

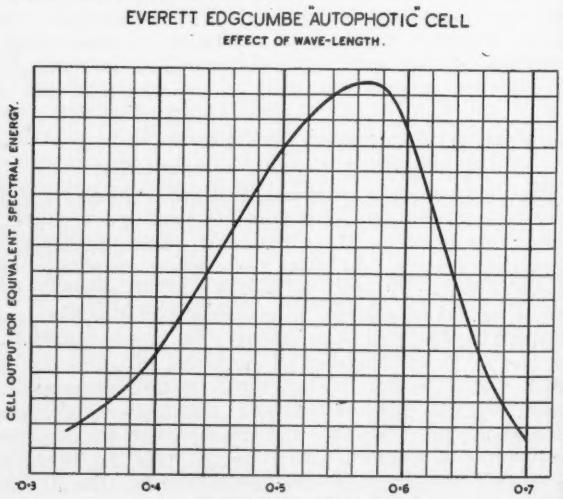


Figure 3.

Electric Discharge Lamps and their Application to Road Lighting

Notes on a paper by Mr. H. Warren and Mr. L. J. Davies read before the Institution of Automobile Engineers (Dec. 1934).

IT will be agreed that some extension of permanent illumination of roadways is desirable, and that it is necessary to consider very carefully what constitutes an adequate standard for modern needs. A decade ago illuminated roads were located in either (1) shopping and important civic areas, or (2) residential and other built-up areas.

Nowadays the increase in importance of road traffic has led to a new conception of street lighting. Statistics of insurance companies show that the accident rate increases after nightfall. But the importance of adequate permanent road lighting is insufficiently appreciated. Our roads and automobiles are as good as any in the world. New devices and new materials are constantly being developed to facilitate road traffic. Yet it remains true that after dark there is less comfort and less safety. The vast cost of installing and maintaining our road systems justifies consideration of the relatively small cost of equipping them with suitable lighting.

Proper road illumination is necessarily concerned with the appearance of the road by night. The lighting should enable motorists to see the width, contour, and direction of the road and some of the moving objects upon its immediate environment, and to distinguish moving objects upon it. Pedestrians should be able to see approaching vehicles without their vision being impaired by glare; as Mr. J. M. Waldram has remarked, the eye of the motorists is in general focussed some 300 ft. ahead, whereas that of the pedestrian is concerned with nearer objects, such as kerbs, gutters, gates, and doorways. The difference between *seeing* and *distinguishing* should also be borne in mind. In daylight, and with the relatively strong artificial illuminations usual in interiors, colour often plays an important part in providing the

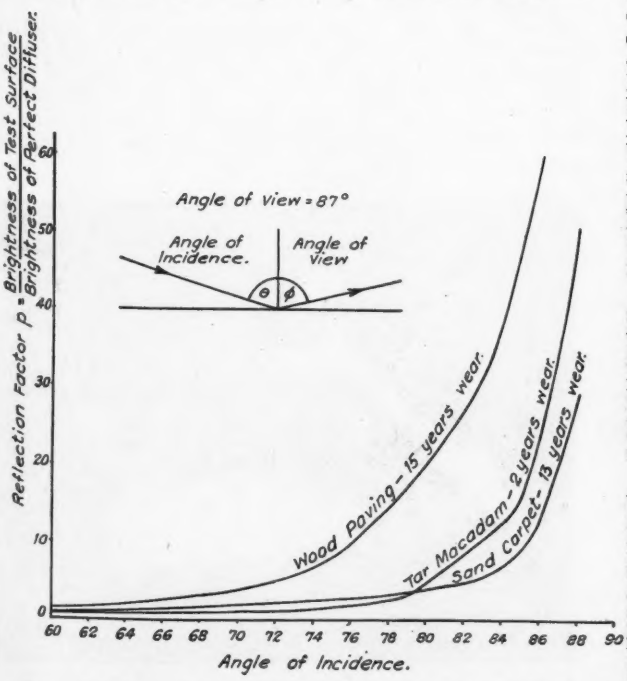


Figure 2. Curves showing variation of Reflection Factor of Road Surface with Angle of Incidence.

Figure 1. Portable foot-candle meter used for Tests of Street Lighting.

contrast whereby the outlines of objects are revealed. But with the weak illuminations usual on the roadway, we must rely mainly on contrast in the sense of difference in brightness between an object and its surroundings. In this connection the authors presented a photograph showing the appearance of four people on a roadway dressed in brown, grey, white, and black. The figures in brown and black were quite distinct. The figure in white (and in a lesser degree the figure in grey) could be seen only with difficulty against the bright road-surface—although in the beam of a headlight exactly the opposite effect might be observed.

These considerations lead us to attach great importance to the conditions of brightness of the road-surface, and especially to the avoidance of abrupt discontinuities of brightness along the length of a road. A light-flux of 0.2 to 2 lumens per sq. ft. is usually adequate though the amount depends much on the road-surface material and other factors. The amount of light reaching the road-surface from an uncontrolled source would ordinarily be very small. Therefore special lanterns become necessary. It is, however, difficult to concentrate light on the roadway without in some measure increasing glare. Because of such difficulties various special methods of road lighting have been proposed, e.g., the use of continuous tubular lamps running along the kerbs or located a few feet above the ground. In the case of such methods the cost alone would appear prohibitive. Another scheme, actually in use abroad, based on the use of a series of rigidly mounted headlight projectors mounted at a low level and throwing beams along the road in the direction of traffic, deserves more consideration. It has the advantage of practically eliminating glare, but some form of unilateral road is essential; also it would be difficult thus to reveal objects that, like the road-surface, reflect little light towards the observer.

The general view appears to be that the only possible expedient in the immediate future is to extend the present system of mounting illuminants on poles, and to make this efficient by concentrating on three main factors: (1) Production of very high efficiency lamps, (2) Accurate control of the light flux from the lamps. by means of lanterns, and (3) Control of the reflection properties of the road-surface.

In the next section of the paper the authors traced the development of electric illuminants up to the advent of electric discharge lamps—high pressure mercury, vapour and sodium. The former type, as is at present favoured by the authors on the grounds of cost, simplicity, of lamp and circuit, shortness of initial warming-up period and colour. Furthermore, the mercury lamp offers possibilities of improvement in colour, by adding red light to the spectrum. The present initial efficiency of the mercury lamp, which needs about five minutes to warm

Figure 3. A street lined by trees with heavy foliage, causing cross shadows in daylight.

Figure 4. The same street illuminated at night by electric discharge lamps in "Diron" Lanterns.

up to the full value, is 42.5 lumens per watt, as compared with fifteen in the case of the gasfilled incandescent (filament) lamp. Sodium lamps are made for wattages of 40 to 200, and with efficiencies from 35 to 60 l.p.w.

Turning next to the design of lanterns and the best method of exploiting the road surface, the authors emphasise the importance of (1) designing lanterns with high flux concentration at large angles of incidence; (2) ensuring a complete cut-off above this selected angle; and (3) the use of visors on cars to cut off the direct beam from the nearest lanterns (thus diminishing glare). After illustrating typical forms of lanterns, the measurement of illumination in the street was discussed. A new form of photometer (see Fig. 1) was described. This portable instruments possesses a focussing lens, photo-voltaic cell, sighting window, meter and graduated cell scale indicating the angle of incidence. Illumination is obtained by multiplying the reading by the calibration constant and the cosine of this angle.

The best kind of road surface for street lighting would be one of light colour, and having a matt surface. Highly polished, dark coloured road surfaces usually show a streak of light extending from the lantern to the observer's eye, and the road is liable to be split up into a number of alternate bright and dark lanes—a condition that may prove dangerous. Concrete and tarred surfaces in which light coloured stone is embedded give a better matt finish. though all surfaces, when covered by a film of water, become spectacular reflectors. If small part-spherical projections could be introduced into the make-up, this would tend to spread the brightness on road surfaces—an effect that was evident at Aberdeen, where the granite sets appeared very uniformly bright, even when wet. Fig. 2 shows the widely different manner in which wood paving, tarmacadam and sand carpeted surfaces behave.

The possibilities of the electric discharge lamp have had the result of concentrating attention upon lantern design. No doubt in the future the nature of road surfaces, in relation to illumination, will receive more study; the black colour of the base material is at present a difficulty. Possibly an alternative lighter coloured substance, such as a natural or synethic gum may some day be good and cheap enough to serve as a substitute for tar and bitumen.

There are said to be nearly 170,000 miles of main and other motor roads in the United Kingdom. Class 1 and 2 roads (M.O.T. classification) amount to about 43,000 miles. The illumination of only a small proportion of such main roads is, of course. a big undertaking, yet not excessive when the advantages are considered. The total expenditure upon maintenance, improvement, cleansing, and construction of highways and bridges in 1931-32 was 78½ million pounds. Five hundred miles of selected roads could probably be illuminated properly for a capital expenditure of less than 1 per cent. of this sum. The adequate illumination of 100 miles of Class 1 road connecting two cities would probably not exceed 3 to 4 per cent. of the capital cost of the road.

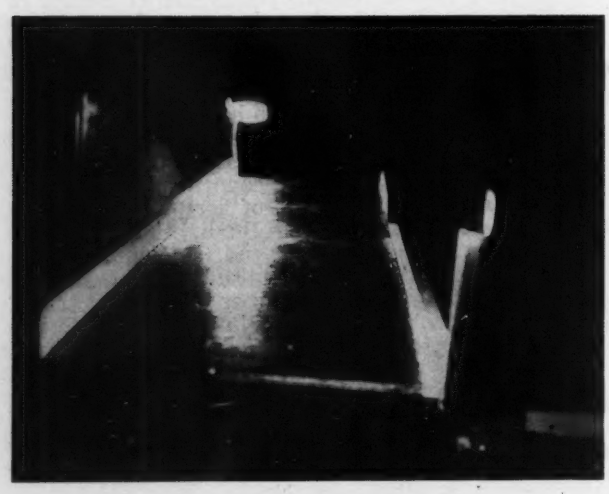


Figure 5. Model Shiny Road showing Bright Lane on Dark Background.

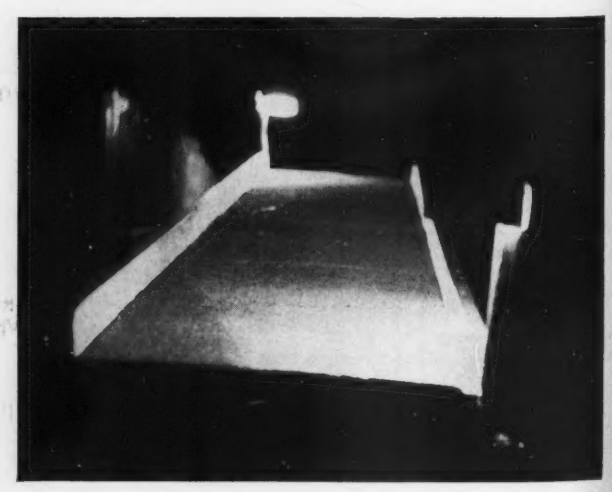


Figure 6. Model Matt Road showing More Uniform Road Brightness.

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An important arterial road made safer for motorists and pedestrians—

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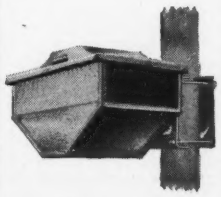
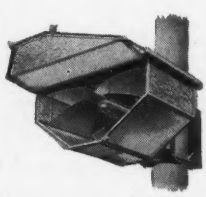


MERCRA "H" Lantern.



MERCRA "H" Lantern showing arrangement of reflectors.

The lantern (illustrated here) is the BTH Mercra 'H' type, invented and developed in the BTH Research Laboratory. The patent magnetic control device incorporated in this lantern, enables the lamp to be burned horizontally. This has hitherto been impossible.

The considerable width of the road and verges, together with the wide lantern spacings of approximately 200 ft. formed a difficult problem. BTH engineers overcame this successfully, and the installation is undoubtedly a noteworthy contribution to the subject of arterial road lighting.

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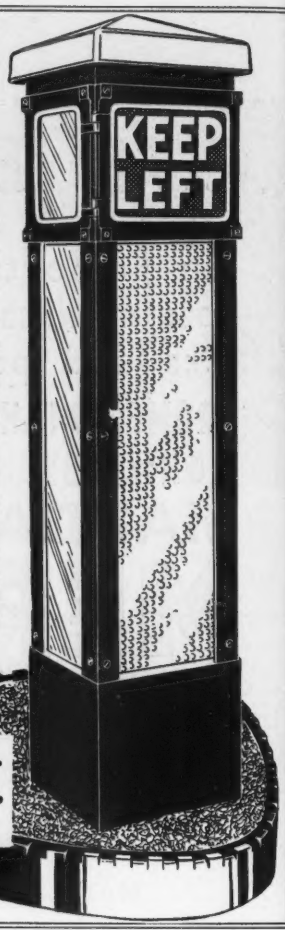

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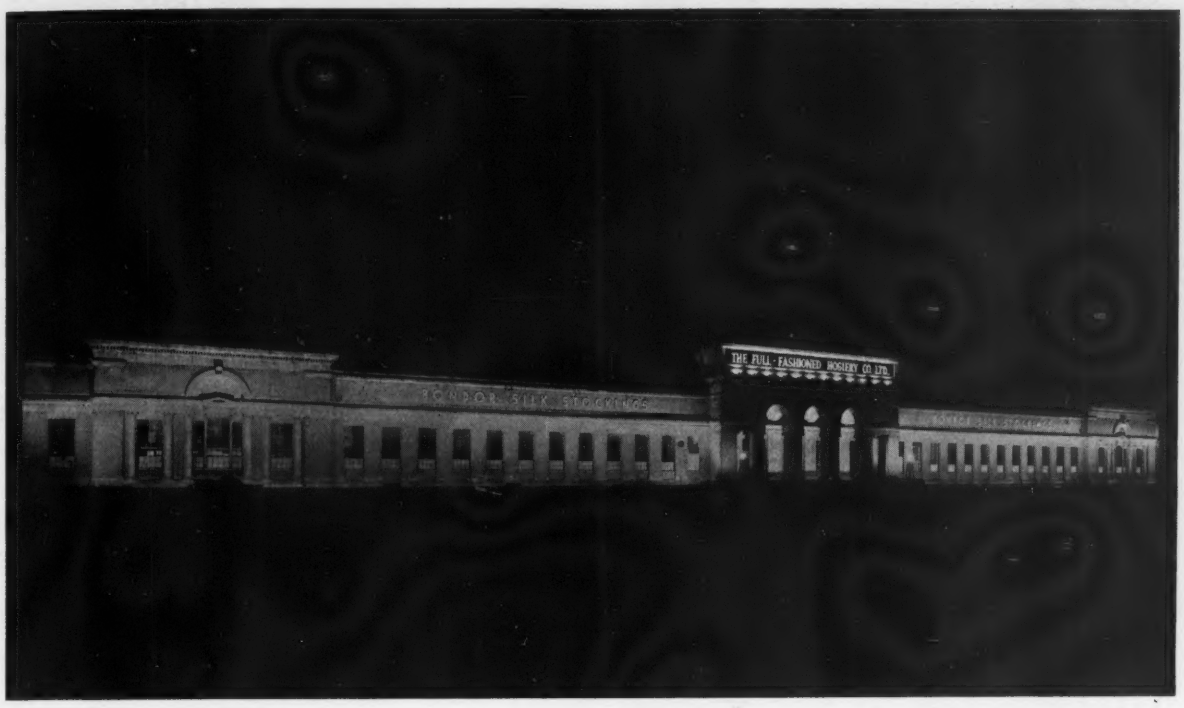
Some Recent Installations of Osira Lamps



Showing the floodlighting with Osira colour-projectors of the premises of the Full-Fashioned Hosiery Co. Ltd., Baldock. The building is 400 ft. long. The end sections are flooded in red and the centre section in pale blue light.

A recent catalogue issued by the General Electric Co., Ltd., contains a description of the Osira lamp and a number of striking illustrations of recent installations of such lamps in the streets. Specially interesting, however, is the extension of their use in bus stations, tramway depots, garages, etc., and for industrial purposes. As is well known, electric discharge lamps can also furnish intense coloured light very efficiently. The use of application of coloured light in bulk has only been imperfectly explored as yet. The picture above shows its use for the floodlighting of a hosiery establishment at Baldock, where the 3-colour display must surely serve as a striking advertisement. Colour-floodlighting of factories having open space around them is often highly effective, especially when they occupy sites easily visible to travellers on main railway lines.

A striking view showing an installation of Osira electric discharge lamps in G.E.C. Lanterns at Rochdale. The photograph illustrates clearly the direction of the greater part of the available flux of light downwards and the high and uniform road-brightness secured.

The aesthetic possibilities, however, especially in connection with combinations of the more delicate hues of coloured light, have hardly been sufficiently explored as yet. This will doubtless be a feature of exhibition lighting of the future. At present tubes containing coloured light are still regarded as a novelty and are accordingly often exposed to view in designs. Ultimately they may be used for concealed lighting as freely as incandescent filament lamps.

3 MORE CHANGES TO "OSIRA" ELECTRIC DISCHARGE LAMPS

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During the last month **567** more "OSIRA" Lamps and G.E.C. Lanterns have been switched on to bring a new standard of safety lighting to London's roads. The conversion of these districts to the latest type of public lighting has resulted in a higher and more even road brightness than has hitherto been thought possible.
This effect is due to the more efficient light output of the "OSIRA" Lamps and the scientific glare-free distribution of their light by the G.E.C. Lanterns.

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GREENWICH ROMFORD WOOD GREEN

ROMFORD
207 "OSIRA" LAMPS
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"OSIRA" Lamps and G.E.C. Lanterns ensure—

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2. **High and even brightness of the roadway and footpath.**
3. **Excellent visibility for a long distance ahead.**

These are the three vital factors which have made "OSIRA" Lamps and G.E.C. Lanterns the units for accident-proof street lighting.

G.E.C. Engineers are at the service of all interested in Street Lighting.

WOOD GREEN
158 "OSIRA" LAMPS
AND G.E.C. "WATFORD" LANTERNS

-PROOF STREET LIGHTING

Floodlighting of a Tennis Court

The artificial lighting of tennis courts has always been a problem that has taxed the ingenuity of designers. The provision of a sufficiently high and even illumination, coupled with avoidance of glare in the eyes of players is a combination by no means easy to obtain. In the recent Holophane installation illustrated in Figs. 1 to 3, the method has been to mount the projectors, by means of wire suspension on poles 20 ft. high, on either side of the court. In all ten 500 watt (FL500E) units are installed. Fig. 2 gives a good impression of the high and even illumination secured—bearing in mind that this is an ordinary grass court which has not the same reflecting power as is available from some courts with a red surface, and also that this court is situated out of doors, so that one cannot obtain the aid of reflection from surrounding surfaces often possible in the case of an indoor court. The installation has proved quite successful—some players actually preferring the artificial lighting conditions to daylight.

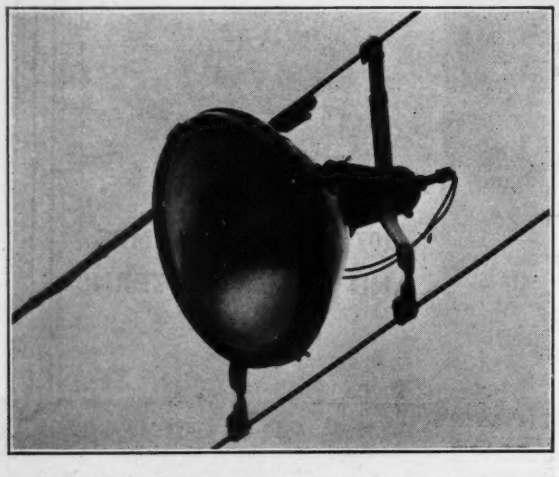


Figure 3. Showing method of suspension of projectors.

The technicalities of floodlighting, by the way, are also well illustrated in a recent Holophane catalogue (No. 500, Section 4) in which illustrations of many striking installations, including churches, swimming pools, and the famous views of Westminster Abbey and Exeter Cathedral appear. This list also contains particulars of the Holophane "pedestal hedralite" type of projector, specially suitable for the floodlighting of buildings from standards on the pavement frontage, a recent introduction which is, perhaps, not yet so familiar as other standard types.

THE Proprietor of British Patent No. 381810, for IMPROVEMENTS IN ANTI-DAZZLE HEADLIGHTS FOR AUTOMOBILES AND THE LIKE is desirous of entering into negotiations with interested parties for the granting of licences thereunder on reasonable terms or for the sale of the Patent outright. Communications please address to Messrs. Dicker, Pollak & Mercer, Chartered Patent Agents, 20-23, Holborn, London, E.C.1.

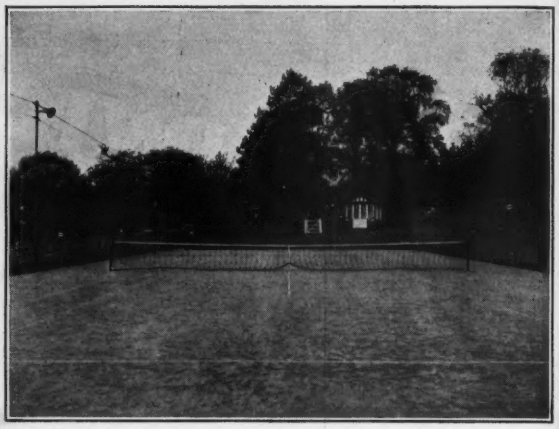
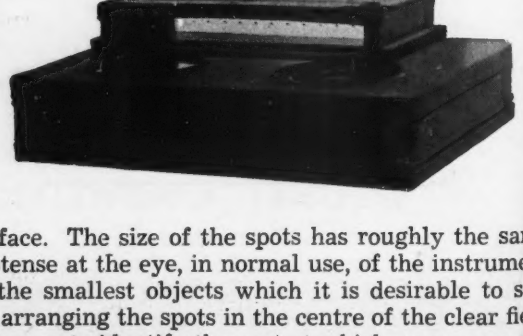


Figure 1. Daylight View of Tennis Court showing lighting units on either side.

Figure 2. A Night View showing the uniformity of illuminations by artificial light.

A Portable Brightness Meter

The compact photometer illustrated below formed an item in the display of the General Electric Co., Ltd., at the recent Physical Society's Exhibition (1935). This instrument is intended for use in streets, for the exploration of surface brightness. It is adapted from a foot-candle meter, and provides in a transparent field a series of small comparison spots of differing and known brightnesses, which can be matched against different parts of the street surface. The size of the spots has roughly the same subtense at the eye, in normal use, of the instrument as the smallest objects which it is desirable to see. By arranging the spots in the centre of the clear field it is easy to identify the spot at which measurements are made. If the instrument is held at about 18 in. from the eye no difficulty from accommodation is found. Provision is made for the insertion of colour filters where necessary.



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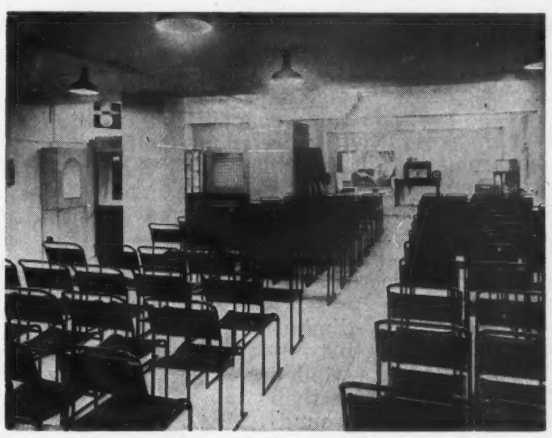
Conferences for Architects

Particulars are before us of Conferences for Architects, which have been arranged by the E.L.M.A. Lighting Service Bureau for 1935. The Conferences will be held in the temporary lecture theatre in Brettenham House, Lancaster Place (Waterloo Bridge, W.C.2), rendered necessary by the recent fire at 2, Savoy Hill. (One is interested to observe, however, that plans for the reconstruction of the Bureau in London are now approaching completion. There will be many new features. The Home Lighting Section is to be enlarged and increased facilities for exterior lighting will be provided.)

The Conference will open on February 4, when an address on "The Technique of Lighting" will be given by Mr. W. J. Jones. This is to be followed by a visit to the new home of the R.I.B.A. Subsequent meetings will be devoted to "Lighting for Displays and Exhibits" (Mr. R. A. Duncan, A.R.I.B.A.), on February 14. "Exterior Lighting of Buildings and their Town Planning Aspects" (Mr. R. O. Sutherland) on February 18, and "Artificial Light in relation to Decorative Surfaces" (Mr. R. O. Ackerley) on February 28.

All Meetings will commence at 7.30 p.m. The excellent plan of selecting an architect to open the discussion on each occasion has been adopted. We are interested to see that at the opening meeting this task will fall to Mr. Howard Robertson.

We have also before us the programme for the immediate future of the Lighting Service Bureau Touring Demonstration. An arduous programme was completed during the past three months. For the first two months of 1935 a series of addresses throughout the south of England has been planned.



The New E.L.M.A. Lecture Demonstration Room at Brettenham House, where temporary premises have been taken.

The King's Silver Jubilee

Special Floodlighting

It was recently announced by the First Commissioner of Works (the Rt. Hon. W. Ormsby Gore, M.P.) that displays of special floodlighting are being planned in this country in connection with the celebration of the King's Silver Jubilee in May. Experience during the International Illumination Congress, 1931, when the floodlighting attracted record crowds to London, may possibly be repeated! Similar displays throughout the Empire are in prospect. Thus it is planned to floodlight the Rock of Gibraltar, where a torchlight tattoo and searchlight display may also be arranged.

The Lighting of the Rome—Ostia Motor Highway (Autostrada) by Sodium Lamps

We are indebted to Dr. W. Uyterhoeven, Ph.D., C.E., who is associated with the Philips Laboratories at Eindhoven (Holland), for the information contained in this article, in which the new Sodium Lamps, and their recent installation on the famous Rome-Ostia Motor Road are described.

Figure 1. Showing the appearance of the section of the Rome-Ostia Highway illuminated by Sodium Lamps.

THE lighting of a section of the well known motor highway extending from Rome to Ostia has recently been converted from incandescent to sodium vapour ("Philora") lamps, and an opportunity of comparing the two methods of lighting is thus presented.

Nature of the Land.

The sodium lamps adopted are of the so-called positive column type. A long and narrow tube, about 600 mm. long, is bent into the form of a "U," at each end of which is an electrode. Both ends are attached to a common base (see Fig. 2) composed of heat insulating material equipped with an Edison Swan socket. A temperature of 300°C. is necessary to obtain sufficient vapour-pressure from the metal and excessive loss of heat is avoided by surrounding the lamp with a double-walled vacuum jacket. The vapour pressure of sodium at ordinary room temperatures is too low to enable a discharge to be started. Hence a filling of rare gas (mainly neon), at a pressure of a few millimetres, is provided, and the lamp is started by a neon discharge. Initially the characteristic orange red-light of neon is emitted, but as the heat generated evaporates the sodium the colour changes to yellow, becoming finally practically monochromatic. The double-walled vacuum jacket exercises another important function, namely to make the temperature of the lamp tube independent of atmospheric conditions. [Cooling of the tube would result in a decrease of sodium vapour pressure and consequent diminution in light.] In this respect the double - walled jacket is much better than a simple vacuum surrounding the lamp. Moreover, the independent heat-insulator has the merit that the lamp alone can be replaced, leaving the vacuum jacket intact. A feature of the lamp is the discharge heated cathodes. These simplify construction considerably as no special heating transformer is required. There is only one lead-in wire per electrode, so that satisfactory electrical insulation is relatively easy to secure. A starting strip, located in the middle of the lamp and connected to one of the electrodes, is provided. The chief technical data relating to lamps of the 100 and 150-watt types are presented in Table I.

Table I.

	100 w. type.	150 w. type.
Discharge Current (A_L)	0.6 a.	0.9 a.
Discharge Voltage (V_L)	170 v.	170 v.
Discharge Watts (W_L)	97 w.	145 w.
Power Factor on discharge	0.95	0.95
Light Flux (Lumens)	5,500	9,000
Efficiency (Lumens per watt)	57	62
Overall Length	400 mm.	515 mm.
Diameter of Vacuum Jacket	50 mm.	65 mm.

These lamps show remarkable characteristics in operation (see Fig. 3). The discharge watts vary only slightly with variations in the supply voltage, as a result of the negative characteristic (i.e., V_L decreasing when A_L increases). This is one of the main factors which ensure a long life (about 3,000 hours, with a loss in light of 10 per cent. per 1,000 hours).

Special Reflector.

The fact that the brightness of the lamp is so low (only about 10 c.p. per sq. cm.), rendering the avoidance of glare a simple matter, is favourable to the design of a good reflector. On the other hand, the relatively great dimensions of the source, corresponding to the low brightness, make it somewhat difficult to direct the light in a given direction. Eventually a somewhat open type of reflector (see Fig. 4), the inner surface of which is white-enamelled, was adopted. This gives a very satisfactory distribution of light (see Fig. 5). The reflector is mounted with the lamp normal to the axis of the road, the vertical plane containing the two legs of the lamp being tilted at about 20° to the horizontal.

Figure 2. 100 w. A.C. "Philora" Sodium Vapour Lamp with discharge heated cathodes.

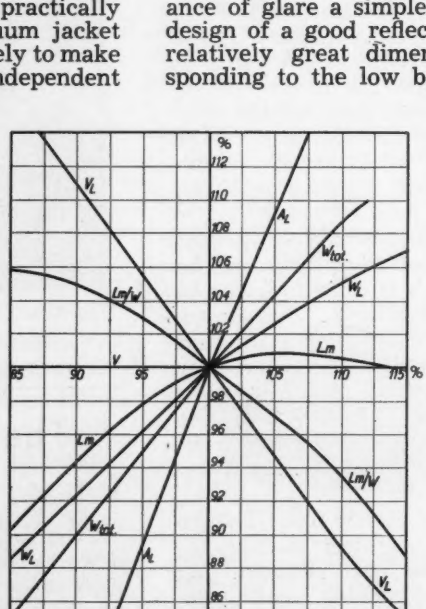


Figure 3. Characteristics of Lamp shown in Figure 2.

Discharge current: A_L Total Watts: W_{tot}
Discharge voltage: V_L Light flux: L_m
Discharge watts: W_L Efficiency: $L_{m/W}$

Nature of Circuit.

It will be seen that economy—a very important factor in street lighting—has been realised first by the high efficiency and long life of the lamp itself, and secondly in the simple open type of reflector—a type rendered possible by the low brightness of the tube and absence of glare.

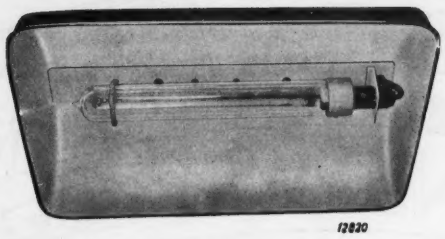


Figure 4. The 100-watt A.C. Sodium Vapour (" Philora ") Lamp mounted in special reflector.

In regard to the electrical circuit economy is best realised by the use of the series system. Each lamp has its own transformer (see Fig. 6), the transformer ratio being, for a given type of lamp, dependent on the current in the primary circuit. These transformers are standardised in two types corresponding respectively to 9.6 amps. and 20 amps. in the primary, and for a maximum pressure of 4,000 volts. This involves the use of about 170 lamps of the 100-watt type in series. With a spacing distance of 120-150 feet, it is thus possible, with a single series, to cover a distance of 4-5 miles, so that one substation per 8-10 miles is necessary.

Two important features of the electric discharge lamp must here be borne in mind. First, as mentioned above, the characteristic is negative. A compensating stabilisation impedance, which is furnished by the combination of constant current transformer and lamp transformer, is therefore, necessary. Secondly, the starting pressure is always higher than the normal pressure on the lamp, a difference which is taken up by the constant current transformer, feeding the primaries of the lamp transformers. The power factor (uncorrected) for such a series installation is about 0.6, which compares favourably with the value of 0.5, generally regarded as characteristic of a parallel installation. As in the case of all series

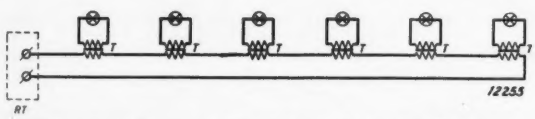


Figure 6. Diagram of Circuit for a Series Installation.

installations, the necessary precautions to avoid excessive over-voltage should be taken. An interesting feature of the system, however, is that no high voltage is present on the lamp side of the individual transformers. The primary and secondary are separated by copper foil, connected to earth. The 100-watt transformer consumes 14 watts, and the 150-watt type, 18 watts. The weight of the 100-watt type is about 12 lb., and the dimensions are 7″ x 5.5″ x 4.4″

The Rome-Ostia Installation.

The original installation on this famous road involved sets of 250 60-watt lamps run in series, each lamp being operated at a current of 7.5 amps., and with a pressure of 8 volts across its terminals. On each sections of the road there are four such series of lamps, two on each side, the lamps on either side being placed alternatively in one series or the other. These lamps each furnish about 1,000 lumens. They are mounted 13 feet high and spaced at intervals of 53 feet on either side of the road, which is 33 feet wide.

The new installation has been constructed by l'Azienda Elettrica of Rome, under the direction of Messrs. Bordoni and Nucci, and with the collaboration of Mr. A. de Bruin of the Philips Company. Each single sodium (Philora) lamp replaced three incandescent lamps. The distance between the lamps thus become three times as great, namely approxi-

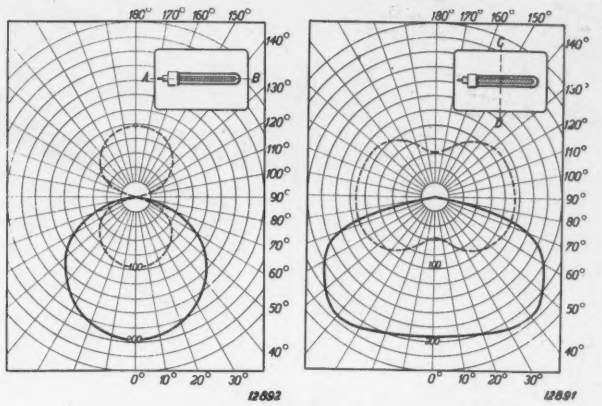


Figure 5. Light Distribution of 100-watt (A.C.) Sodium Vapour Lamp mounted in special reflector shown in Figure 4.

mately 160 feet, and the lamps are mounted at a height of 33 feet. Altogether there are 64 lamps of each type (100-watt or 150-watt), and the section of the road thus illuminated is about 1.8 miles long.

Each of the four series of lamps extending from the Acilia substation towards Rome, which originally contained 250 60-watt incandescent lamps, now comprises:—

160 incandescent 60-watt lamps		9.6 kw.
16 sodium (Philora) 100-watt lamps		1.6 kw.
16 „ „ 150-watt lamps		2.4 kw.
Transformer Losses:—		
100-watt lamps; 16 x 14	224 watts	
150-watt lamps; 16 x 18	288 watts	
	510 watts	0.51 kw.
Line Loss		2.25 kw.
Const. Current Transformer Loss (4 per cent.)		0.8 kw.
		17.16 kw.

The constant current transformer operates at 7.5 amps., 45 frequency and 20 kw.

In Fig 7 values of the illumination (in foot-candles) measured on a plane 1 metre above the ground are presented for the section containing 100-watt lamps. The uniformity of illumination is considered very good, and Fig. 1 gives a good idea of the general effect.

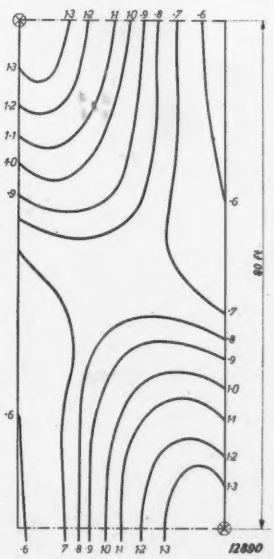


Figure 7. Showing distribution of illumination (in foot-candles) obtained from the Sodium Vapour (" Philora ") 100-watt lamps on a stretch 80 feet long, of the Rome-Ostia motor highway. The maximum illumination recorded is 1·3 foot-candles and the minimum 0·6. Attention is drawn to the good uniformity obtained.

TRADE NOTES AND NEWS

Floodlighting by Gas

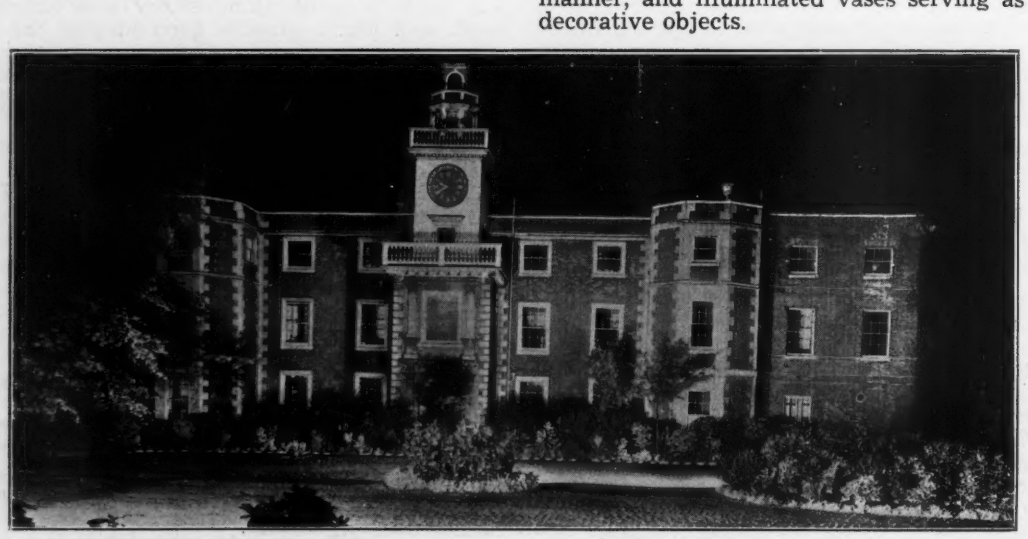
"Lux ex Tenebris" is the Latin phrase figuring on the front page of a recent list issued by W. Parkinson and Co., of Birmingham, and certainly some of the illustrations of floodlighting with gas in the catalogue illustrate the idea of light emerging from the shadows. Views of gardens and factories thus illuminated, and descriptive data relating to the various types of "Floodlite" lamps available, are preceded by an introductory exposition of the art of floodlighting and by some simple calculations showing how the lamps may be applied. A table showing the illumination desirable for surfaces of different reflecting power and in areas where the lighting is poor, medium, or bright is presented. The Parkinson 10-light alignment lamp, which may be either of the horizontal or upward beam type has a lateral spread of 120° and a vertical spread of 45°, and the line of mantles is considered very effective in producing the "soft" and mellow effect which has been claimed to be a characteristic feature of gas floodlighting. In dealing with a typical building 100 feet long and 30 feet high, for which 6 ft.-c. is provided, the cost is estimated at 7d. an hour, which certainly seems a very moderate figure to pay for a display of this kind.

A Fine Hailware Display

The picture above shows an example of up-to-date window dressing, that of Croydon Corporation. The large illuminated doorway and stairs and side wings, and some of the smaller fittings, have been made and supplied by Hailwood and Ackroyd, Ltd. (Morley, Leeds), and are of British manufacture throughout.

Furn-Art Fittings

A pleasing series of fittings, including some original designs in silk is issued by Furn-Art, Ltd. (Enfield). Perhaps the more interesting are the table lamps, but there are also pendants treated in the modern manner, and illuminated vases serving as effective decorative objects.



A Castle Floodlighted by Night

Bruce Castle, Tottenham, illustrated above, was recently floodlighted by the Tottenham and District Gas Company in connection with the local Borough Charter Celebrations. We are indebted to the "Gas Journal" for this picture showing the striking effect of the floodlighting, which attracted many sightseers.

Mazda Light Tubes

These New Forms of Lamps have special applications for Luminous Signs and for Architectural and Decorative Lighting.

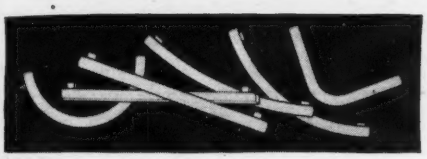


Figure 1. Various Types of Light Tubes available.

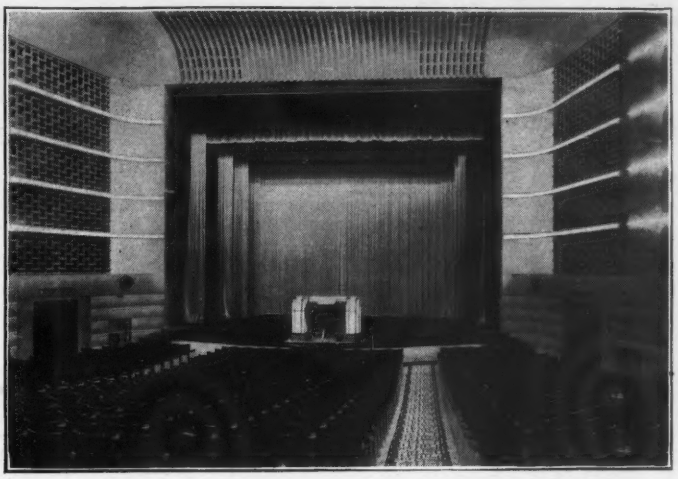


Figure 2. The Plaza Cinema, Sutton, where the auditorium lighting is done with Mazda Light Tubes.

One of the most striking recent developments in incandescent lamps has been the introduction of the new tubular types, having a filament running the complete length of the tube. As Fig. 1 illustrates, such tubes may be either straight or curved and may assume a great variety of shapes. The tubes are made of diffusing glass and can be supplied in a variety of colours both sprayed and coloured opal, thus affording continuous lines of fully diffused light of low brightness. Such tubes naturally are proving of value in connection with signs and luminous effects; for instance, they afford an alternative means of producing the continuous lines usually produced with neon tubes in cases where the high voltage of the latter may be a drawback or where some special scheme of colouration is desired. Their main application, however, is probably for architectural and decorative lighting. (See Fig. 2.)

Siemens Glassware

A recent catalogue from Siemens Electric Lamps and Supplies, Ltd., illustrates typical globes, cubes and well-glasses in opal and also many varieties of fancy shades—simple in design but showing a great advance upon the glassware of this type usual a few years ago. From the same firm we receive a list of "coiled coil" filament lamps—a development with which, even to-day, all consumers are not familiar.

Prismatic Refractors for Gas Street-Lighting

A new list issued by Holophane, Ltd., gives full particulars of the now familiar dish refractors for use with gas lamps, which are mounted immediately below the mantles, and also of the refracting ring-plates which encircle the mantle and afford an alternative method of improving the distribution of light. There can be no doubt that such devices extend considerably the possibilities of gas lighting. A specially interesting development is the new "Holgas" panel type gas lantern, which was shown at Aberdeen last September and has been described in our columns. This not only improves the light distribution by substantially increasing the component at about 15° below the horizontal, but has also a pleasing appearance.

Benjamin Reflectors for Electric Discharge Lamps

A handy leaflet issued by Benjamin Electric, Ltd., illustrates the above new line of reflectors which, it may be recalled, was shown at the opening meeting of the Illuminating Engineering Society last October. The new all-glass "Coolicon" reflector, also shown on that occasion, is being featured in a display card available to the trade, of which photographic post-cards have been produced.

Floodlighting the Cheddar Caves

The famous caverns in the Cheddar Gorge have recently been floodlighted. Lord Weymouth, the owner, sought the advice of Mr. Waldo Maitland, by whom ultimately twenty-seven different types of reflectors (all but one of the G.E.C. pattern) were installed. The problem presented difficulties by reason of the nature of the rock and the necessity of concealing projectors from the view of spectators. All these difficulties were successfully surmounted.

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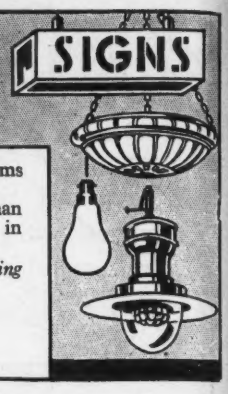

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"Lux" s the only French journal which specialises in all aspects of lighting; it is the official organ of the Association Francaise des Ingenieurs de l' Eclairage (equivalent to the Illuminating Engineering Society in France).

It furnishes a complete record of interesting developments in lighting in France and on the Continent. It is fully illustrated and in particular devotes a considerable number of its pages to Decorative Lighting.

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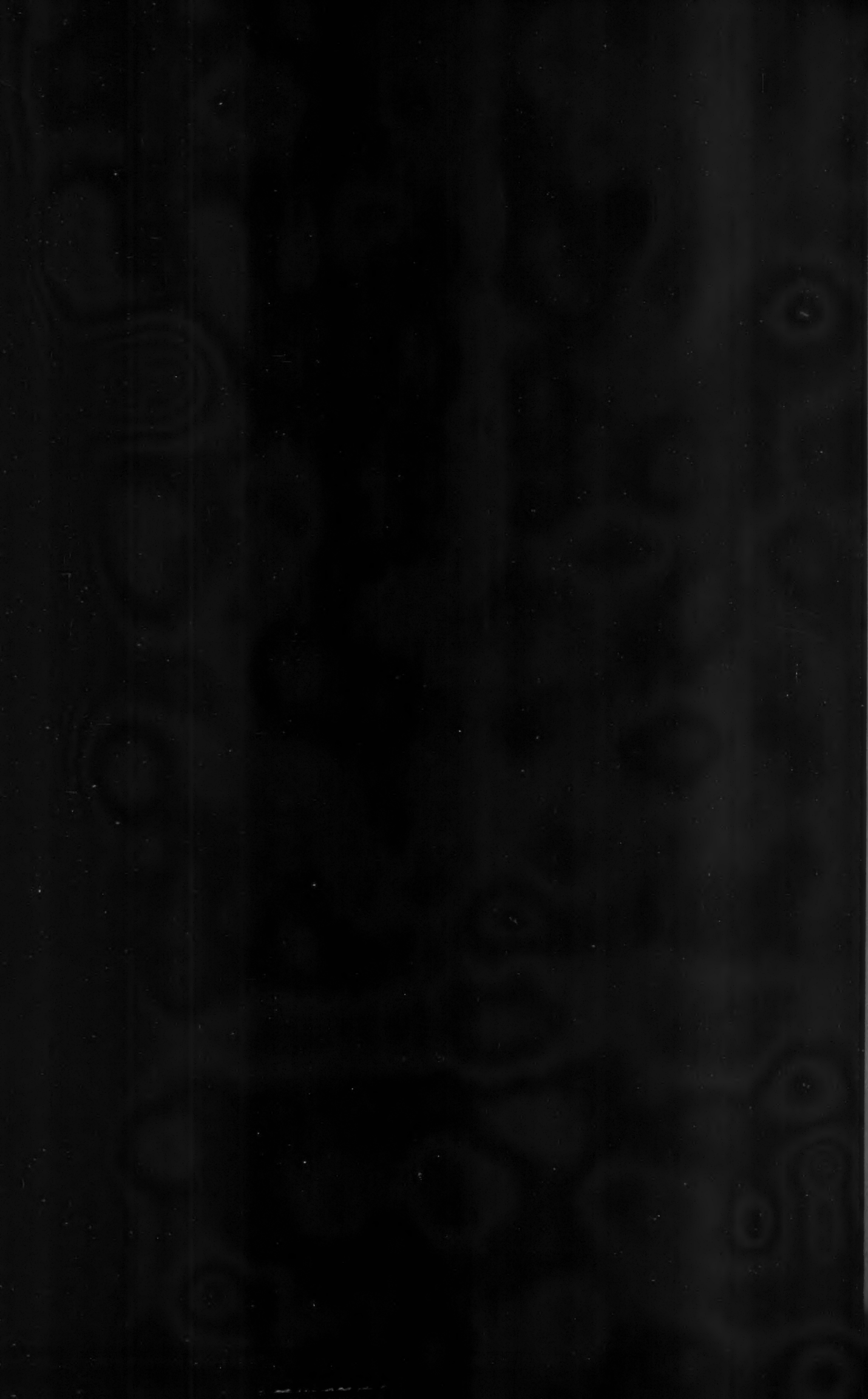

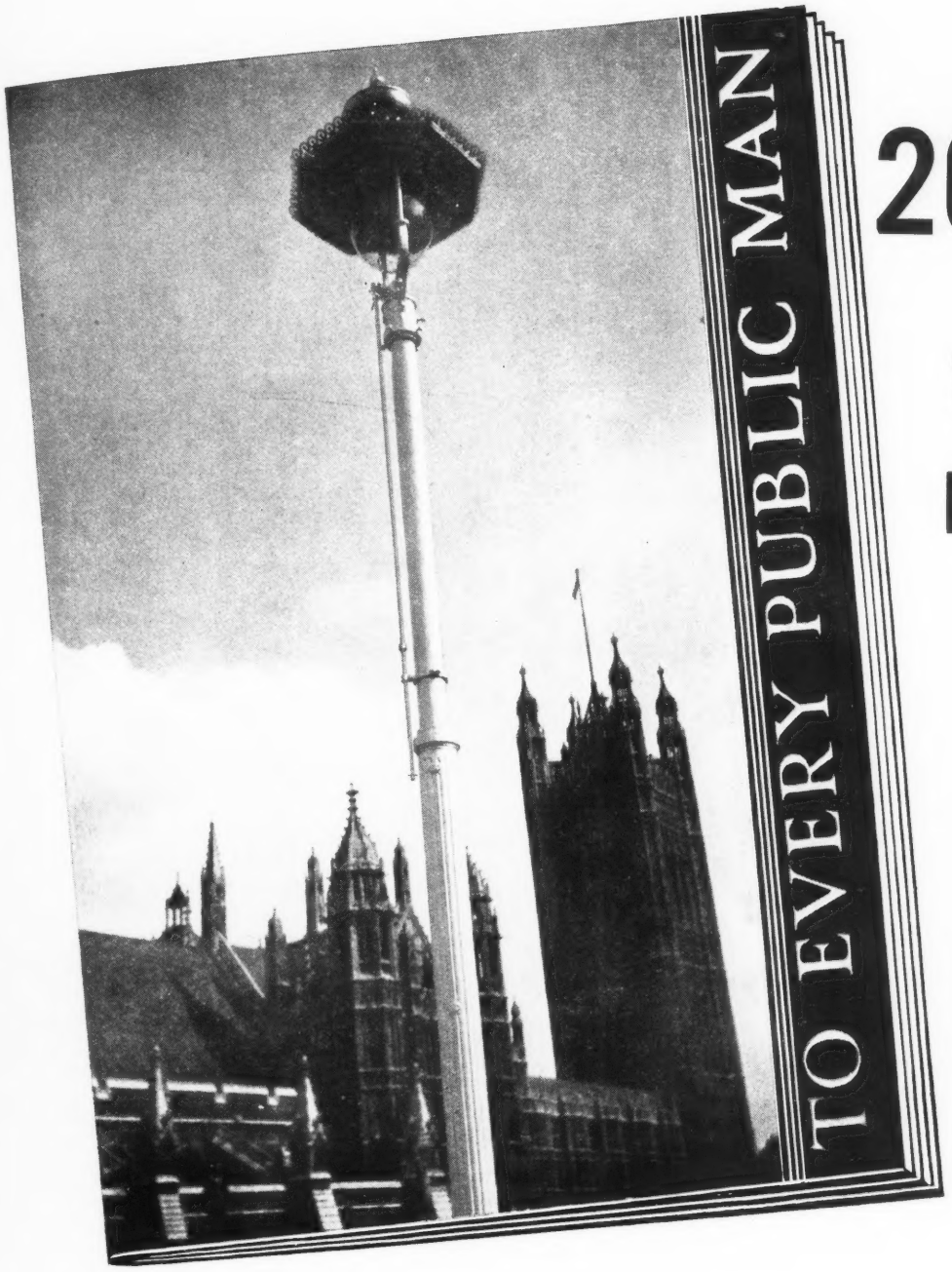

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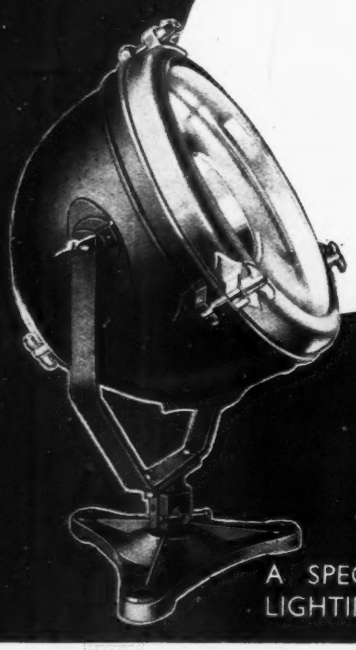

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